

NATIONAL SERVICE MANUAL
TWENTY-SIXTH SUPPLEMENT—1933 CAR MODELS

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NATIONAL AUTOMOTIVE SERVICE
SAN FRANCISCO, CALIFORNIA

1933 CAR MODELS—EQUIPMENT USED

Page	CAR	Model	Serial No.	Year	BATTERY		Gr. Ter.	Switch		LIGHTING					
					Make	Type		Make	Model	Fuses	Circuit Breaker	Edison Head	Mazda Aux.	Lamp Side Dsh.-tail	Numbers Stop Dome
1942	AUBURN	8-101	8-101-1001 Up	1933	U.S.L.	XY-15X-6A	Pos.	Sor.Man.	5670-A	20	*	1000	*	63	63-1158.1158.....81
1942	AUBURN	8-105	8-105-1001 Up	1933	U.S.L.	XY-15X-6A	Pos.	Sor.Man.	5670-A	20	*	1000	*	63	63-1158.1158.....81
1944	AUBURN	12-161,165	1001 Up	1933	U.S.L.	XY-17A	Pos.	Sor.Man.	5670-A	20	*	1000	*	63	63-1158.1158.....81
1946	AUSTIN	Bantam	L-12799 Up	1933	U.S.L.	XY-9A	Neg.	B. & S.	50518	20	*	1110	*	63	63-1158.1158.....81
1948	BUICK	33-50		1933	Delco	13-JW	Neg.	Delco-R	487-B,86-R	*	D.R.410-K	1000	63	*	63-1158.1158.....81
1950	BUICK	33-60		1933	Delco	15-GW	Neg.	Delco-R	487-B,86-R	*	D.R.410-K	1000	63	*	63-1158.1158.....81
1950	BUICK	33-80, 90		1933	Delco	17-DW	Neg.	Delco-R	487-B,86-R	*	D.R.410-K	1000	63	*	63-1158.1158.....81
1952	CADILLAC	355-C	3,000,001 Up	1933	Delco	17-CF	Pos.	Delco-R	486-S,87-A	10	D.R.480-Z	3001	63	*	63-1158.1158.....81
1954	CADILLAC	370-C	4,000,001 Up	1933	Delco	21-CF	Pos.	Delco-R	486-S,87-A	10	D.R.480-Z	3001	63	*	63-1158.1158.....81
1956	CADILLAC	452-C	5,000,001 Up	1933	Delco	25-AF	Pos.	Delco-R	486-S,87-A	10	D.R.480-Z	3001	63	*	63-1158.1158.....81
1958	CHEVROLET	Std. 6 CC		1933	Delco	13-N-CU	Neg.	Delco-R	478-H	15	*	1110	63	63	63-1158.1158.....63
1958	CHEVROLET	Mstr. 6 CB	CB-1001 Up	1933	Delco	13-N-CU	Neg.	Delco-R	478-H	15	*	1110	63	63	63-1158.1158.....63
1960	CHRYSLER	CO-6	6,576,001 Up	1933	Willard	WS-2-15	Pos.	Clum	9454	20	*	1116	63	*	63-1158.1158.....87
1962	CHRYSLER	CT Royal	8 7,000,001 Up	1933	Willard	WH-2-15	Pos.	Clum	9454	20	*	1116	63	*	63-1158.1158.....87
1964	CHRYSLER	CQ Imp. 8	7,529,001 Up	1933	Willard	WS-4-17	Pos.	Clum	9454	20	*	1116	63	*	63-1158.1158.....87
1966	CHRYSLER	CL* Cust. Imp. 8		1933	Willard	WH-5-19	Pos.	Clum	9454	*	D.R.410-H	1116	63	*	63-1158.1158.....87
1968	CONTINENTAL	Beacon	40-1001 Up	1933	U.S.L.	A-13-A	Neg.	Sor.Man.	5670-AA	20	*	1110	63	*	63-1158.1158.....63
1970	CONTINENTAL	Flyer	60-1001 Up	1933	U.S.L.	XY-13A	Neg.	Sor.Man.	5670-AA	20	*	1110	63	*	63-1158.1158.....63
1972	CONTINENTAL	Ace	81-1001 Up	1933	National	H3-15X	Neg.	Sor.Man.	5670-AA	20	*	1110	63	*	63-1158.1158.....63
1974	CUNNINGHAM	V-10		1933	Willard	RH-4-17	Neg.	Delco-R	486-D	10	D.R.5759	1129	*	63	63-1158.1158.....64
1976	DE SOTO	SD	5,056,001 Up	1933	Willard	WT-1-15	Pos.	Clum	9454	20	*	1116	63	*	63-1158.1158.....87
1978	DODGE	DP-6	3,579,001 Up	1933	Willard	WS-1-13	Pos.			20	*	1116	63	*	63-1158.1158.....87
1980	DODGE	DO-8	4,527,001 Up	1933	Willard	WS-4-17	Pos.	Clum	9454	20	*	1116	63	*	63-1158.1158.....87
1844	DUESENBERG	J		1933	Exide	3-LXRV-21-2G	Neg.	Delco-R	486-D	*	D.R.5759	1110	*	63	63-1158.1158.....—
*1710	DU PONT	G		1933	Exide	3-XC-15-1	Pos.	Sor.Man.	360-A	15	*	1110	81	63	63-1158.1158.....63
1982	ESX. TERRAPLANE	Std. 6	K-6 364,125 Up	1933	National	H3-13X	Neg.	Sor.Man.	B-5670-A	20	*	1110	63	*	63-1158.1158.....87
1982	ESX. TERRAPLANE	Spec. 6	KU-5001 Up	1933	National	H3-13X	Neg.	Sor.Man.	B-5670-A	20	*	1110	63	*	63-1158.1158.....87
1984	ESX. TERRAPLANE	KT-8	65,001 Up	1933	Exide	3-VXA-15-1	Neg.	Sor.Man.	B-5670-A	20	*	1110	63	*	63-1158.1158.....87
1986	FORD	Four		1933	Ford		Pos.	Essex		20	*	1110	63	63	63-1158.1158.....63
1988	FORD	V-8-112		1933	Ford		Pos.	Essex		20	*	1110	63	*	63-1158.1158.....63
1990	FRANKLIN	16-B		1933	Willard	WSB-21	Pos.	Delco-R	486-V	20,30	*	1110	63	*	63-1158.1158.....63
1992	FRANKLIN	17-B		1933	Willard	RH-5-19	Pos.	Delco-R	486-V	20,30	*	1110	63	*	63-1158.1158.....63
1994	FRANKLIN	18 Olympic	11001 Up	1933	Willard	WH-1-13	Pos.	Delco-R	486-V	20	*	1110	63	*	63-1158.1158.....63
1996	FRONTENAC	6-70	1302 Up	1932	P-O-L	611-SRA	Neg.	Clum	5192	20	*	1110	63	*	63-1158.1158.....63
1996	FRONTENAC	6-85	K-1001 Up	1932	P-O-L	613-SHA	Neg.	Sor.Man.	5670-AA	20	*	1110	63	*	63-1158.1158.....63
1968	FRONTENAC	C-400		1933	U.S.L.	A-13-A	Neg.	Sor.Man.	5670-AA	20	*	1110	63	*	63-1158.1158.....63
1970	FRONTENAC	C-600		1933	U.S.L.	XY-13A	Neg.	Sor.Man.	5670-AA	20	*	1110	63	*	63-1158.1158.....63
1998	GRAHAM	65-Six	1,605,001 Up	1933	Willard	WS-1-13	Pos.	Clum	9463	20	*	1116	63	*	63-1158.1158.....63
2000	GRAHAM	64-Std. 8	1,800,001 Up	1933	Willard	WS-2-15	Pos.	Clum	9463	20	*	1116	63	*	63-1158.1158.....63
2000	GRAHAM	57A-Cust. 8	1,020,001 Up	1933	Willard	WS-2-15	Pos.	Clum	9463	20	*	1116	63	*	63-1158.1158.....63

1933 CAR MODELS—EQUIPMENT USED

Make	IGNITION		Make	Switch Model	STARTER		GENERATOR		Relay Regulator	Year	MODEL	CAR	Page
	Coil Model	Dist. Model			Make	Model	Make	Model					
Delco-Remy	528-C	660-Z	Electrolock	15-S	Delco-Remy	722-F,Q	Delco-Remy	955-H	265-B	1933	8-101	AUBURN	1942
Delco-Remy	528-C	660-Z	Electrolock	15-S	Delco-Remy	736-E	Delco-Remy	955-H	265-B	1933	8-105	AUBURN	1942
Delco-Remy	528-C	667-Z	Electrolock	15-SD	Delco-Remy	543,46	Delco-Remy	931-E,F	265-G	1933	12-161,5	AUBURN	1944
Auto-Lite	IG-4065	IGB-4034-A	B.&S.	50518	Auto-Lite	MAK-4001	Auto-Lite	GAS-4101	CB-4008	1933	Bantam	AUSTIN	1946
Delco-Remy	528-H	661-L	Oakes	Hershey	Delco-Remy	725-V,X	Delco-Remy	956-B	265-B	1933	33-50	BUICK	1948
Delco-Remy	528-H	661-K	Oakes	Hershey	Delco-Remy	725-W	Delco-Remy	956-B	265-B	1933	33-60	BUICK	1950
Delco-Remy	528-H	661-K	Oakes	Hershey	Delco-Remy	725-W	Delco-Remy	956-B	265-B	1933	33-80,90	BUICK	1950
Delco-Remy	528-G	662-Y	Delco-Remy	426-T	Delco-Remy	728-P	Delco-Remy	927-S	480-Z	1933	355-C	CADILLAC	1952
Delco-Remy	526-E	4110	Delco-Remy	426-T	Delco-Remy	495	Delco-Remy	931-D	480-Z	1933	370-C	CADILLAC	1954
Delco-Remy	530-K	4111	Delco-Remy	426-T	Delco-Remy	495	Delco-Remy	931-D	480-Z	1933	452-C	CADILLAC	1956
Delco-Remy	536-W	622-L	Electrolock	428-A	Delco-Remy	714-L	Delco-Remy	943-J	265-H	1933	CC	CHEVROLET	1958
Delco-Remy	536-W	644-D	Electrolock	428-A	Delco-Remy	714-L	Delco-Remy	943-J	265-H	1933	CB	CHEVROLET	1958
Delco-Remy	537-U	622-C,644-L	Delco-Remy		Delco-Remy	734-R	Delco-Remy	943-S,37-D		1933	CO	CHRYSLER	1960
Delco-Remy	537-U	661-R	Delco-Remy		Delco-Remy	725-Z	Delco-Remy	937-D,F		1933	CT	CHRYSLER	1962
Delco-Remy	537-U	661-G,661-T	Delco-Remy		Delco-Remy	725-Z	Delco-Remy	937-D,F		1933	CQ	CHRYSLER	1964
Delco-Remy	534-R	661-F,661-U	Coil Lock		Delco-Remy	728-T	Delco-Remy	967-A		1933	CL*	CHRYSLER	1966
Auto-Lite	IG-4606	IGB-4202	Electrolock	16-S	Auto-Lite	MZ-4034	Auto-Lite	GAM-4505	CB-4014	1933	Beacon	CONTINENTAL	1968
Auto-Lite	IG-4606	IGB-4083	Electrolock	16-S	Auto-Lite	MZ-4034	Auto-Lite	GAM-4505	CB-4014	1933	Flyer	CONTINENTAL	1970
Auto-Lite	IG-4310	IGB-4084,5	Coil Lock		Auto-Lite	MAB-4037	Auto-Lite	GAL-4330	CB-4014	1933	Ace	CONTINENTAL	1972
NorthEast	5023660	10874	Coil Lock		Delco-Remy	350	Delco-Remy	285	265-B	1933	V-10	CUNNINGHAM	1974
Delco-Remy	537-S,Y	622-C,644-J	Delco-Remy		Delco-Remy	734-R,L	Delco-Remy	943-S,37-D	265-G	1933	SD	DE SOTO	1976
Delco-Remy	537-V	622-H,644-K	Delco-Remy		Delco-Remy	734-H	Delco-Remy	943-S,37-E	265-G	1933	DP-6	DODGE	1978
Delco-Remy	537-Y	661D,661-S	Delco-Remy		Delco-Remy	725-Z	Delco-Remy	937-D,F		1933	DO-8	DODGE	1980
Delco-Remy	553-A,B	4044	Coil Lock		Delco-Remy	429	Delco-Remy	428	265-B	1933	J	DUESENBERG	1844
Delco-Remy	528-C	668-B	Clum	8889A	Delco-Remy	720-Q	Delco-Remy	945-U	265-B	1933	G	DU PONT	*1710
Auto-Lite	IG-4308	IGB-4074A	Coil Lock		Auto-Lite	MAJ-4031	Auto-Lite	GAM-4503	CBA-4002	1933	K-6	ESX. TERRAPLANE	1982
Auto-Lite	IG-4308	IGB-4074A	Coil Lock		Auto-Lite	MAJ-4031	Auto-Lite	GAM-4503	CBA-4002	1933	KU	ESX. TERRAPLANE	1982
Auto-Lite	CE-4303	IGH-4024A	Coil Lock		Auto-Lite	MAB-4051	Auto-Lite	GAM-4503	CBA-4002	1933	KT-8	ESX. TERRAPLANE	1984
Auto-Lite		Ford	Oakes	Hershey	Auto-Lite	Ford	Auto-Lite	Ford	Ford	1933	Four	FORD	1986
Mallory		Ford	Oakes	Hershey	Auto-Lite	Ford	Auto-Lite	Ford	Ford	1933	V-8-112	FORD	1988
Delco-Remy	532-C	644E	Clum		Delco-Remy	723-C	Delco-Remy	957-E	265-B	1933	16-B	FRANKLIN	1990
Delco-Remy	532-C	667-A	Clum		Delco-Remy	545	Delco-Remy	931-G	265-B	1933	17-B	FRANKLIN	1992
Delco-Remy	533-R	644E	Electrolock	17-S	Delco-Remy	723-C	Delco-Remy	957-E	265-B	1933	18	FRANKLIN	1994
Auto-Lite	IG-4302	IGB-4031-H	Coil Lock		Auto-Lite	MAB-4037	Auto-Lite	GAL-4143	CB-4021-S	1932	6-70	FRONTENAC	1996
Auto-Lite	IG-4303	IGB-4031-A	Coil Lock		Auto-Lite	MAB-4037	Auto-Lite	GAL-4143	CB-4021-S	1932	6-85	FRONTENAC	1996
Auto-Lite	IG-4606	IGB-4202	Electrolock	16-S	Auto-Lite	MZ-4034	Auto-Lite	GAM-4505	CB-4014	1933	C-400	FRONTENAC	1968
Auto-Lite	IG-4606	IGB-4083	Electrolock	16-S	Auto-Lite	MZ-4034	Auto-Lite	GAM-4505	CB-4014	1933	C-600	FRONTENAC	1970
Delco-Remy	536-U	632-Z	Delco-Remy	428-H	Delco-Remy	734-N	Delco-Remy	965-V	265-B	1933	65-Six	GRAHAM	1998
Delco-Remy	536-U	661-J	Delco-Remy	428-H	Delco-Remy	734-N	Delco-Remy	965-V	265-B	1933	64-Std. 8	GRAHAM	2000
Delco-Remy	536-U	661-J	Delco-Remy	428-H	Delco-Remy	725-K	Delco-Remy	965-V	265-B	1933	57A-Cust.8	GRAHAM	2000

1933 CAR MODELS—EQUIPMENT USED

Page	CAR	Model	Serial No.	Year	Make	BATTERY		Gr. Ter.	Switch		LIGHTING						
						Type			Make	Model	Fuses	Circuit Breaker	Edison Head	Mazda Aux.	Lamp Side Dsh.	Numbers -tail	Used Stope Dome
2002	HUDSON	Super 6	1,300,501 Up	1933	Exide	3-VXA-15-1	Neg.	Sor.Man.	B-5670-A	30	*	1110	63	*	63-1158	1158	87
2004	HUDSON	Eight	936,703 Up	1933	Exide	3-VXA-15-1	Neg.	Sor.Man.	B-5670-A	30	*	1110	63	*	63-1158	1158	87
2006	HUPMOBILE	321-K	K-5001 Up	1933	Willard	WH-2-15	Pos.	Sor.Man.	B-5670-A	20	*	1000	63	*	63	87	81
2008	HUPMOBILE	322-F	F-8801 Up	1933	Willard	WH-2-15	Pos.	Sor.Man.	B-5670-A	20	*	1000	63	*	63	87	81
2010	HUPMOBILE	326-I	I-5751 Up	1933	Willard	WH-2-15	Pos.	Sor.Man.	B-5670-A	20	*	1000	63	*	63	87	81
2012	LA SALLE	345-C	2,000,001 Up	1933	Delco	17-CF	Pos.	Delco-R	486-H	10	D.R.	480-Z	1000	63	*	63	87
2014	LINCOLN	V-12-136		1933	Exide	LX-15-21L	Neg.	Essex		5	D.R.	1000	63	*	63	87	81
2016	LINCOLN	V-12-145		1933	Exide	LX-15-21L	Neg.	Essex		5	D.R.	1000	63	*	63	87	81
2018	MARMON	16		1933	Exide	3-XCH-21-1	Pos.	Pines	A-808	*	D.R.	410-E	1000	63	*	87-1158	87
2020	NASH	Big Six	1120	1933	U.S.L.	KW-13A	Neg.	Delco-R	478-N	20	*	1110	63	*	63-1158	1158	—
2022	NASH	Std. 8	1130	1933	U.S.L.	KW-13A	Neg.	Delco-R	478-N	20	*	1110	63	*	63-1158	1158	—
2024	NASH	Spec. 8	1170	1933	U.S.L.	KW-13A	Neg.	Sor.Man.	4210-A	20	*	1110	63	*	63-1158	1158	—
2026	NASH	Adv. 8	1180	1933	U.S.L.	KW-15A	Pos.	Delco-R	486-C	20	*	1110	63	*	63-1158	1158	—
2028	NASH	Ambas.8	1190	1933	Exide	3-MXC-17-1N	Pos.	Delco-R	486-K	20	*	1110	63	*	63-1158	1158	—
2030	OLDSMOBILE	F-33	24,001 Up	1933	Delco	13-L	Neg.	Delco-R	478-Y	15	D.R.	1116	63	*	63-87	87	81
2032	OLDSMOBILE	L-33	7,001 Up	1933	Delco	13-J	Neg.	Delco-R	478-Y	15	D.R.	1116	63	*	63-87	87	81
2034	PACKARD	1001-2 Eight		1933	P-O-L	A-619-ST	Pos.			20	*	3003	63	*	63	87	81
2036	PACKARD	1003-4 Super 8		1933	P-O-L	A-619-ST	Pos.			20	*	3003	63	*	63	87	81
2038	PACKARD	1005-6 Twelve		1933	P-O-L	A-619-ST	Pos.			20	*	3003	63	*	63	87	81
2040	PIERCE ARROW	836		1933	Willard	WH-4-17	Pos.	Delco-R	487-C,E	*	D.R.	410-F	1000	81	*	63-81	1129
2042	PIERCE ARROW	1236		1933	Willard	WH-5-19	Pos.	Delco-R	487-C,E	*	D.R.	410-F	1000	81	*	63-81	1129
2042	PIERCE ARROW	1242, 47		1933	Willard	WH-5-19	Pos.	Delco-R	487-C,E	*	D.R.	410-F	1000	81	*	63-81	1129
2044	PLYMOUTH	Std. 6	PC-1,817,101 Up	1933	Willard	WS-1-13	Pos.			20	*	1116	63	*	63-1158	1158	87
2044	PLYMOUTH	Six	PC 1,759,001 Up	1933	Willard	WS-1-13	Pos.			20	*	1116	63	*	63-1158	1158	87
2044	PLYMOUTH	Deluxe6	PD-2,000,001 Up	'33	Willard	WS-1-13	Pos.			20	*	1116	63	*	63-1158	1158	87
2046	PONTIAC	601	770,001 Up	1933	Delco	15-KW	Neg.	Delco-R	478-Z	20	*	1116	63	*	63	63	63
2048	REO	S-2 Flying Cloud		1933	Willard	WH-1-13	Neg.	Delco-R	486-X	20	*	1110	63	*	63	87	63
2050	REO	N-2 Royale 8		1933	Willard	RH-4-17	Neg.	Delco-R	482-F	20	*	1110	63	*	63	87	63
2052	ROCKNE	10 or 31	16,151 Up	1933	Willard	WH-1-13	Pos.	Clum	9236	20	*	1110	63	*	63-1158	1158	81
2054	STUDEBAKER	56 Six	5,133,401 Up	1933	Willard	WH-1-13	Pos.	Clum	9115	*	D.R.	410-L	1110	63	*	63	87
2056	STUDEBAKER	73 Comdr.	8,040,001 Up	1933	Willard	WH-1-13	Pos.	Clum	9115	5	D.R.	410-L	1110	63	*	63	87
2056	STUDEBAKER	82 Pres.	7,040,001 Up	1933	Willard	WH-4-17	Pos.	Clum	9115	5	D.R.	410-L	1110	63	*	63	87
2058	STUDEBAKER	92Spdwy.Pres.	6027401 Up	'33	Willard	WH-4-17	Pos.	Clum	9115	5	D.R.	410-L	1110	63	*	63	87
1928	STUTZ	LAA Six		1933	P-O-L	A-619-ST	Neg.	Delco-R	486-G	*	D.R.	410-C	1133	63	*	63	87
2060	STUTZ	CS, SV-16		1933	P-O-L	A-619-ST	Neg.	Delco-R	486-G	*	D.R.	410-C	1000	63	*	63	87
2062	STUTZ	CD, DV-32		1933	P-O-L	A-619-ST	Neg.	Delco-R	486-G	*	D.R.	410-C	1000	63	*	63	87
2064	WILLYS SIX	6-90A	14,201 Up	early 1933	U.S.L.	XY-13X-7A	Neg.	Pines	A-805,6700	20	*	1110	63	*	63-1158	1158	*
2066	WILLYS EIGHT	8-88A	2,401 Up	early 1933	U.S.L.	3-HVX-7X-6A	Neg.	Pines	A-805,6700	20	*	1110	63	*	63-1158	1158	*
2068	WILLYS KNGT.	66-E	7,601 Up	early 1933	U.S.L.	HW-17A	Neg.	Pines	6700	20	*	1110	63	*	63-1158	1158	63
2070	WILLYS OVLD.	77	1,001 Up	1933	U.S.L.	CW-11A	Neg.			20	*	1110	63	*	63-1158	1158	63
.....	WILLYS OVLD.	99	1,001 Up	1933	U.S.L.	XY-13X-7A	Neg.			20	*	1110	63	*	63-1158	1158	63

1933 CAR MODELS—EQUIPMENT USED

Make	IGNITION		Switch	STARTER		GENERATOR		Relay	Year	Model	CAR	Page
	Coil Model	Dist. Model		Make	Model	Make	Model					
Auto-Lite	IG-4605	IGB-4074-A	Electrolock	16-S	Auto-Lite	MAJ-4025	Auto-Lite	GAM-4503	CBA-4002	1933	Super Six HUDSON	2002
Auto-Lite	CE-4017	IGB-4009B	Electrolock	15-S	Auto-Lite	MAB-4041	Auto-Lite	GAL-4544	CBA-4002	1933	Eight HUDSON	2004
Auto-Lite	IG-4604	IGC-4056	Electrolock	16-B	Auto-Lite	MAB-4050	Auto-Lite	GAL-4524	CB-4021	1933	321-K HUPMOBILE	2006
Auto-Lite	CE-4402	IGH-4021-A	Electrolock	5-B	Auto-Lite	MAD-4118	Auto-Lite	GAR-4317	CB-4011-A	1933	322-F HUPMOBILE	2008
Auto-Lite	CE-4402	IGH-4021-A	Electrolock	5-B	Auto-Lite	MAB-4042	Auto-Lite	GAG-4138	XA-407-B	1933	326-I HUPMOBILE	2010
Delco-Remy	528-G	662-Y	Delco-Remy	426-T	Delco-Remy	728-P	Delco-Remy	927-S	480-Z	1933	345-C LA SALLE	2012
Auto-Lite	CE-4001-L	IGM-4002	Oakes	Hershey	Auto-Lite	MAO-4003,4	Auto-Lite	GBC-4001	CB-4014-L	1933	V-12 136 LINCOLN	2014
Auto-Lite	CE-4001-L	IGM-4002	Oakes	Hershey	Auto-Lite	MAO-4005,6	Auto-Lite	GBC-4001	CB-4014-L	1933	V-12 145 LINCOLN	2016
Delco-Remy	528-A,33-S	4084	Coil Lock		Delco-Remy	489	Delco-Remy	927-N	265-B	1933	16 MARMON	2018
Auto-Lite	CE-4601	IGB-4081-B	Electrolock	16-S	Auto-Lite	MAB-4049	Auto-Lite	GAR-4205-2	CB-4021	1933	1120 NASH	2020
Auto-Lite	CE-4601	IGH-4023	Electrolock	16-S	Auto-Lite	MAB-4049	Auto-Lite	GAR-4205-2	CB-4021	1933	1130 NASH	2022
Auto-Lite	CE-4001	IGH-4017-A	Oakes	Hershey	Auto-Lite	MAB-4026	Auto-Lite	GAL-4329	CB-4021	1933	1170 NASH	2024
Auto-Lite	CE-4402	IGK-4004	Oakes	Hershey	Auto-Lite	MAB-4033	Auto-Lite	GAR-4601-3	CB-4021	1933	1180 NASH	2026
Auto-Lite	CE-4402	IGK-4001	Delco-Remy	425-S	Auto-Lite	MAB-4024	Auto-Lite	GAR-4601-3	CB-4021	1933	1190 NASH	2028
Delco-Remy	534-T	632-P	Coil Lock		Delco-Remy	734-K	Delco-Remy	953-S	265-G	1933	F-33 OLDSMOBILE	2030
Delco-Remy	534-T	662-K	Coil Lock		Delco-Remy	725-Y	Delco-Remy	953-S	265-G	1933	L-33 OLDSMOBILE	2032
NorthEast	5033449	5033450	Electrolock	16-S	Owen-Dyneto	DI-1034	Owen-Dyneto	CL-1005	21262	1933	1001-2 PACKARD	2034
NorthEast	5033449	5033450	Electrolock	16-S	Owen-Dyneto	DN-1107	Owen-Dyneto	CO-1130	21262	1933	1003-4 PACKARD	2036
Auto-Lite	CE-4020	IGO-4001	Electrolock	15-S	Owen-Dyneto	DN-1072	Owen-Dyneto	CO-1119	21262	1933	1005-6 PACKARD	2038
Delco-Remy	537-E	662-J	Oakes	Hershey	Delco-Remy	497	Delco-Remy	927-V	265-G	1933	836 PIERCE ARROW	2040
Delco-Remy	537-E	4105	Oakes	Hershey	Delco-Remy	498	Delco-Remy	927-V	265-G	1933	1236 PIERCE ARROW	2042
Delco-Remy	537-E	4105	Oakes	Hershey	Delco-Remy	498	Delco-Remy	927-V	265-G	1933	1242, 47 PIERCE ARROW	2042
Delco-Remy	537-T,W	644-H	Delco-Remy		Delco-Remy	734-H	Delco-Remy	943-S,37-E	265-F	1933	Std. Six PC. PLYMOUTH	2044
Delco-Remy	537-T,W	622-H,44-H	Delco-Remy		Delco-Remy	734-H	Delco-Remy	943-S,37-E	265-F	1933	Six PC. PLYMOUTH	2044
Delco-Remy	537-T,W	644-H	Delco-Remy		Delco-Remy	734-H	Delco-Remy	943-S,37-E	265-F	1933	PD. PLYMOUTH	2044
Delco-Remy	534-W	661-M	Coil Lock		Delco-Remy	734-G	Delco-Remy	937-B	265-G	1933	601 PONTIAC	2046
Delco-Remy	536-S	644-M	Electrolock	16-S	Delco-Remy	718-H	Delco-Remy	955-R	265-B	1933	S-2 REO	2048
Delco-Remy	536-T	660-K	Electrolock	16-S	Delco-Remy	728-M	Delco-Remy	955-G	265-B	1933	N-2 REO	2050
Auto-Lite	IG-4304	IGB-4070-A	Coil Lock		Auto-Lite	MAJ-4030	Auto-Lite	GAM-4501	CB-4022	1933	10 or 31 ROCKNE	2052
Delco-Remy	537-X	622-A	Coil Lock		Delco-Remy	718-Z	Delco-Remy	943-V	265-G	1933	56 STUDEBAKER	2054
Delco-Remy	537-X	662-H	Coil Lock		Delco-Remy	718-Y	Delco-Remy	955-C	265-G	1933	73 STUDEBAKER	2056
Delco-Remy	537-X	662-H	Coil Lock		Delco-Remy	718-Y	Delco-Remy	955-C	265-G	1933	82 STUDEBAKER	2056
Delco-Remy	537-X	662-G	Coil Lock		Delco-Remy	497	Delco-Remy	927-J	265-B	1933	92 STUDEBAKER	2058
Delco-Remy	528-C	4043	Delco-Remy	426-K	Delco-Remy	726-C	Delco-Remy	391	266-N	1933	LAA STUTZ	1928
Delco-Remy	531-C	4028	Oakes	Hershey	Delco-Remy	727-C	Delco-Remy	391	266-N	1933	CS,SV-16 STUTZ	2060
Delco-Remy	531-C	660-W	Oakes	Hershey	Delco-Remy	727-C	Delco-Remy	391	266-N	1933	CD,DV-32 STUTZ	2062
Auto-Lite	IG-4602	IGB-4032	Electrolock	16-S	Auto-Lite	MZ-4030,24	Auto-Lite	GAL-4331	CB-4021	1932-3	6-90A WILLYS SIX	2064
Auto-Lite	IG-4602	IGH-4013	Electrolock	16-S	Auto-Lite	MAB-4035	Auto-Lite	GAL-4331	CB-4021	1932-3	8-88A WILLYS EIGHT	2066
NorthEast	22636	TBU-10877	Electrolock	5-B	Auto-Lite	MAB-4018	Auto-Lite	GAG-4134	CB-4021	1932-3	66-E WILLYS KNGT.	2068
Auto-Lite	IG-4406	IGB-4078	Electrolock	17-A	Auto-Lite	MZ-4033	Auto-Lite	GAM-4504	CB-4008	1933	77 WILLYS OVLD.	2070
Auto-Lite	IG-4603	IGB-4032-A	Electrolock	16-S	Auto-Lite	MAJ-4029	Auto-Lite	GAL-4550	CB-4008	1933	99 WILLYS OVLD.	

1933 CAR MODELS
CAR PAGES

AUBURN

STANDARD EIGHT MODEL 8-101 (1933), SERIAL NUMBERS 8-101-1001 UP
SALON EIGHT MODEL 8-105 (1933), SERIAL NUMBERS 8-105-1001 UP
DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On plate on right hand body sill at front door.
ENGINE NUMBER:—Stamped on front of crankcase at left hand side.
ENGINE:—Lycoming, Model GU, 8 cylinder, 'L' head type, 3x4 $\frac{3}{4}$ " bore and stroke, 268.6 cubic inch displacement, rated at 28.8 H.P., develops 100 H.P. at 3200 R.P.M. Standard compression ratio 5.26-1. Optional high compression ratio 5.75-1. A special ignition setting is used for each type engine (see Timing).

BATTERY:—U.S.L., Type XY-15X-6A, 6 volt, 15 plate, 104 ampere hour capacity (5 ampere rate). Starting capacity 119 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—Battery mounted under right hand front seat.

Dimensions:—Width, 7 $\frac{1}{4}$ ". Length, 10 $\frac{1}{4}$ ". Height, 8 $\frac{5}{8}$ ".

IGNITION:—Coil Model 528-C. Coil is mounted on the dash.

Ignition Current:—6-3 amperes at 6 volts (engine running), 4.6 amperes at 6 volts (engine stopped).

Ignition Switch:—Type 15-S Electrolock. Switch is assembled as unit with distributor with breaker lead protected by armored cable. Switch has two 'on' positions. First 'on' position with key turned to left is timing position with ignition on and Startix inoperative. Second 'on' position with key turned to right is regular running position with Startix operative.

IGNITION:—Coil Model 528-C. Coil mounted under cowl. Ignition current 6-3 amperes at 6 volts (engine running), 4.6 amperes at 6 volts (engine stopped). Ignition switch Type 'B' Electrolock. See Equipment Section for complete data on Electrolocks.

Distributor Model 669-Z. Two breaker arm, 4 lobe cam type with semi-automatic advance. Breaker contacts open alternately at 45 degree intervals corresponding to 90 degree firing interval of engine. Contacts must be synchronized—see Timing. Breaker contact gap set at .018-.024 inch. To set gap, loosen lockscrew on stationary contact mounting plate and turn eccentric adjusting screw, tighten locking screw.

Manual Advance:—15° (engine) maximum.

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.024".

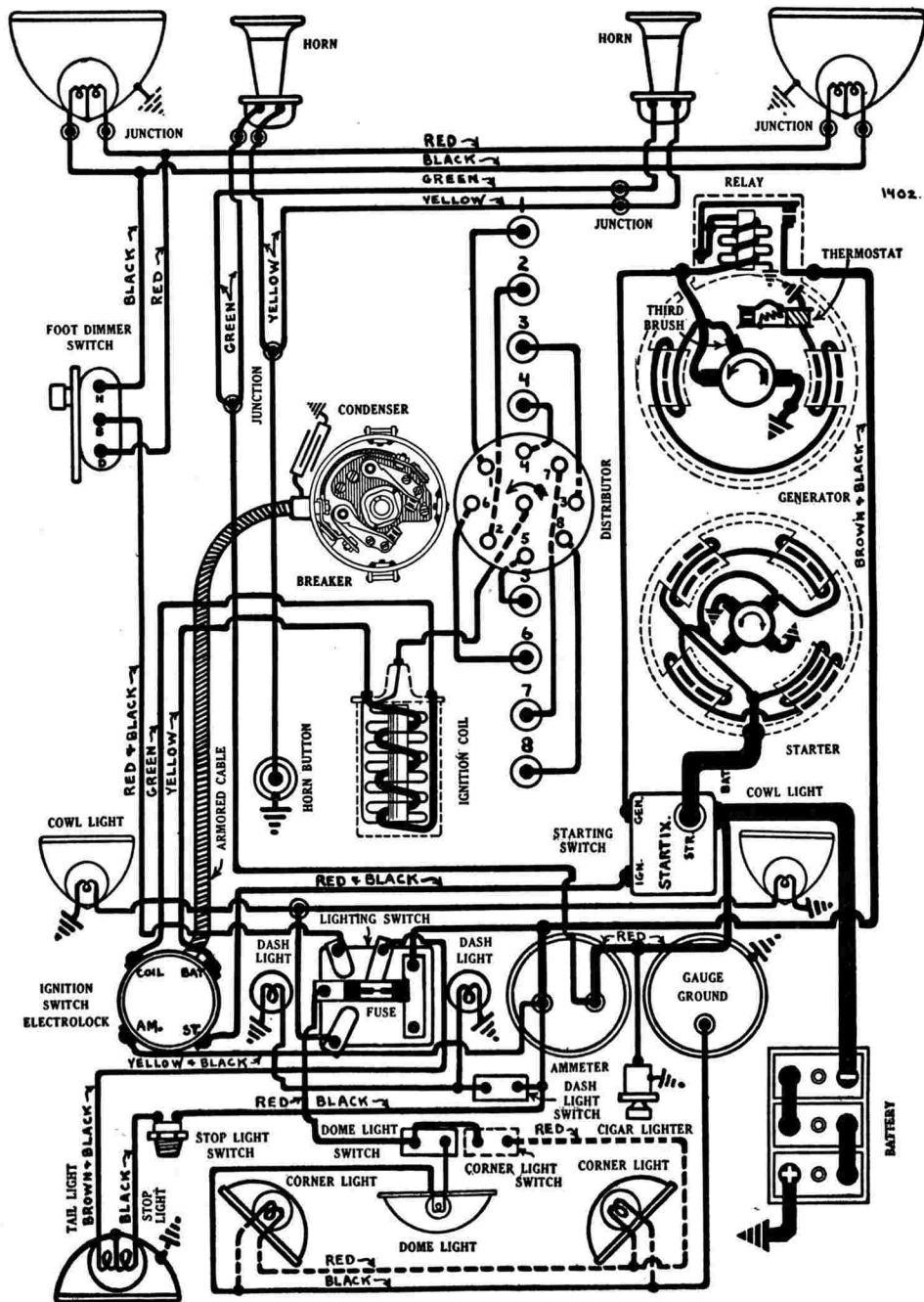
Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
2.5	Start	250		500	
26.5	13.25	1300		2600	

Mounting:—Distributor is mounted on the cylinder head. Electrolock must be removed as a unit with distributor whenever distributor is taken off the car. See Equipment Section for complete details on removing Electrolock. To remove distributor, disconnect all wires and free Electrolock at dash, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

Oiling:—1000 Miles. Turn down grease cup under distributor head one full turn. Keep cup filled with medium cup grease. Take off distributor cap and rotor, fill wick oiler in center of shaft with light engine oil, put one drop oil on breaker arm pivot pins, apply thin film vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting 12 $\frac{1}{2}$ degrees or 3 $\frac{1}{4}$ teeth on flywheel (.070 inch piston travel) before top dead center (standard compression engines), 8 $\frac{1}{2}$ ° or 2 $\frac{1}{4}$ teeth on flywheel (.0326" piston travel) before top dead center (optional high compression engines). To set ignition timing, fully advance manual spark control, see that distributor is rotated clockwise to full extent of advance arm slot. With No. 1 piston on compression stroke turn engine over until a point on the flywheel 3 1/4 teeth before the top



AUBURN

STANDARD EIGHT MODEL 8-101 (1933), SERIAL NUMBERS 8-101-1001 UP
SALON EIGHT MODEL 8-105 (1933), SERIAL NUMBERS 8-105-1001 UP
DELCO-REMY SYSTEM

dead center mark for pistons 1 and 8 is directly opposite indicator on flywheel housing. Loosen advance arm clamp screw, rotate distributor until first set of contacts (mounted directly on breaker plate) begin to open, tighten clamp screw, connect spark plugs as indicated on diagram. Use test lamp to determine contact opening.

Synchronization of Contacts. Synchronize contacts on a rotary spark gap or use special Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section. Contacts can be synchronized after distributor has been timed to engine by turning engine over 90° to firing position of piston No. 6 (3 1/4 teeth before top dead center), then loosen lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws, check contact gap. If outside limits of .018-.024 inch, reset at .022 inch, repeat synchronization.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—7/8-18 SAE. Champion Type C-4. Set gaps at .020-.025 inch.

VALVE TIMING:—Valves at left of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

To Check Valve Timing:—Set tappet clearance No. 1 intake valve at .010 inch (cold). With No. 8 piston on compression turn engine over until piston is slightly before top dead center with a point on the flywheel approximately 1.35 teeth before the top dead center mark is opposite the indicator on housing. No. 1 intake valve should begin to open at this point.

Valve Specifications

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 7/16"	.3410-.3425"	5 1/4"	30°	11/32"
Exhaust	1 13/32"	.3410-.3425"	5 1/4"	45°	11/32"

Tappet Clearance

Intake .006-.008" (hot) -.010" (cold)

Exhaust .006-.008" (hot) -.010" (cold)

Spring Pressure

Open 87-92 pounds

Intake Valves

Timing

Exhaust Valves

Open—5° before top dead center.

Open—50° before lower dead center.

Close—40° after lower dead center.

Close—10° after top dead center.

CARBURETION:—Stromberg Model URO-2 Updraft Carburetor (Model 8-101) or Model EX-3 Downdraft Carburetor (Model 8-105) (see Carburetor Section for complete data).

Fuel Pump:—Stewart-Warner mechanical type fuel pump operated by eccentric on camshaft (see Equipment Section).

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model 722-F, 722-Q (Model 8-101), 736-E (Model 8-105). Starter drive—Through reduction gears and a Bendix drive. Rotation of armature shaft is clockwise at commutator end. Brush spring tension 24-28 ounces. Starter cranks engine at 134 R.P.M. (normal speed) drawing 175 amperes.

Model 722-F—Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3500	5.0	70
22 " "	Lock	3.0	600

Model 722-Q, 736-E—Starter Data

0 " "	6000	5.0	65
15 " "	Lock	3.15	570

Startix:—This model equipped with Startix automatic starting switch. Not necessary to disconnect Startix when timing engine if special timing position of Electrolock ignition switch is used (turn ignition key to left).

Mounting:—Starter is flange mounted on forward face of flywheel housing at right of engine. To remove, disconnect cable and starting switch control, take out three flange mounting capscrews, pull starter forward to clear Bendix, lift out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler at each end of armature shaft.

Six Months. Take out grease plug in reduction gear case. Repack gears with graphite grease.

GENERATOR:—Model 955-H. Third brush regulation, thermostat control. Thermostat operates at 165° F. (contacts open—cuts in resistance) reducing generator output approximately 40%. Rotation is counter-clockwise at commutator end. Maximum charging rate is 19-21 amperes (cold) at 8.0 volts reached at 1450 R.P.M. or approximately 20 M.P.H.

Charging Rate Adjustment. Loosen small round lock screw on endplate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.35-8.5	1450	9-12	7.35-7.65	1800-2000

Brush Spring Tension:—14-18 ounces on each brush.

Field Current:—4.0-6.1 amperes at 6 volts across field terminals.

Motoring:—Approximately 5.5 amperes at 6 volts.

Mounting:—Generator mounted on swinging bracket at right front of engine. Belt driven from the crankshaft. The water pump is mounted on the commutator end of the generator and is driven by the armature shaft extension. To remove generator, disconnect lead, drain radiator, disconnect water pump hose connections, loosen adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out two bolts forming bracket hinge under generator, lift generator and water pump out. Water pump can be removed by taking out capscrews in generator end plate bosses.

Belt Adjustment. To take up drive belt, loosen adjustment clamp bolt and bracket hinge bolts, pull generator away from engine, tighten clamp bolt and mounting bolts. The belt tension should be just enough to drive generator and water pump without slipping.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler at each end

RELAY:—Model 265-B. Relay is mounted on generator field frame. Relay contacts close at 600 R.P.M. (generator) with generator voltage of 6.75-7.5 volts and open with 0-2.5 ampere discharge current. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

LIGHTING:—Soreng Manegold Switch Model 5670-A. Delco-Remy Dimmer Switch Model 465-W, 465-C (R.H.D.). Lighting switch mounted on back of instrument board controlled by push-pull button on instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated dimmer switch on toeboard.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda Number
Headlights	6-8	32-32	D.C.	1000
Cowl lights	6-8	3	SC	63
Instrument lights	6-8	3	SC	63
Stop and tail light	6-8	21-2	DC	1158
Dome and corner lights	6-8	6	SC	81

Note:—Stop and tail light is a special double filament bulb. The tail light lead (Brown and Black wire) must be connected to the 2 cp. filament.

FUSES:—20 ampere capacity Type 4AG. fuse mounted on back of lighting switch.

HORNS:—Klaxon vibrator type horn mounted under engine hood (Model 8-101), Model K-31, Type 1396 (low note), Type 1370 (high note) matched tone twin horns mounted under headlights (Model 8-105). Current draw 4.0-6.5 amperes at 6 volts.

AUBURN

MODEL 12-161 (1933), SERIAL NUMBERS 12-161-1001 UP
SALON MODEL 12-165 (1933), SERIAL NUMBERS 12-165-1001 UP
DELCO-REMY SYSTEM

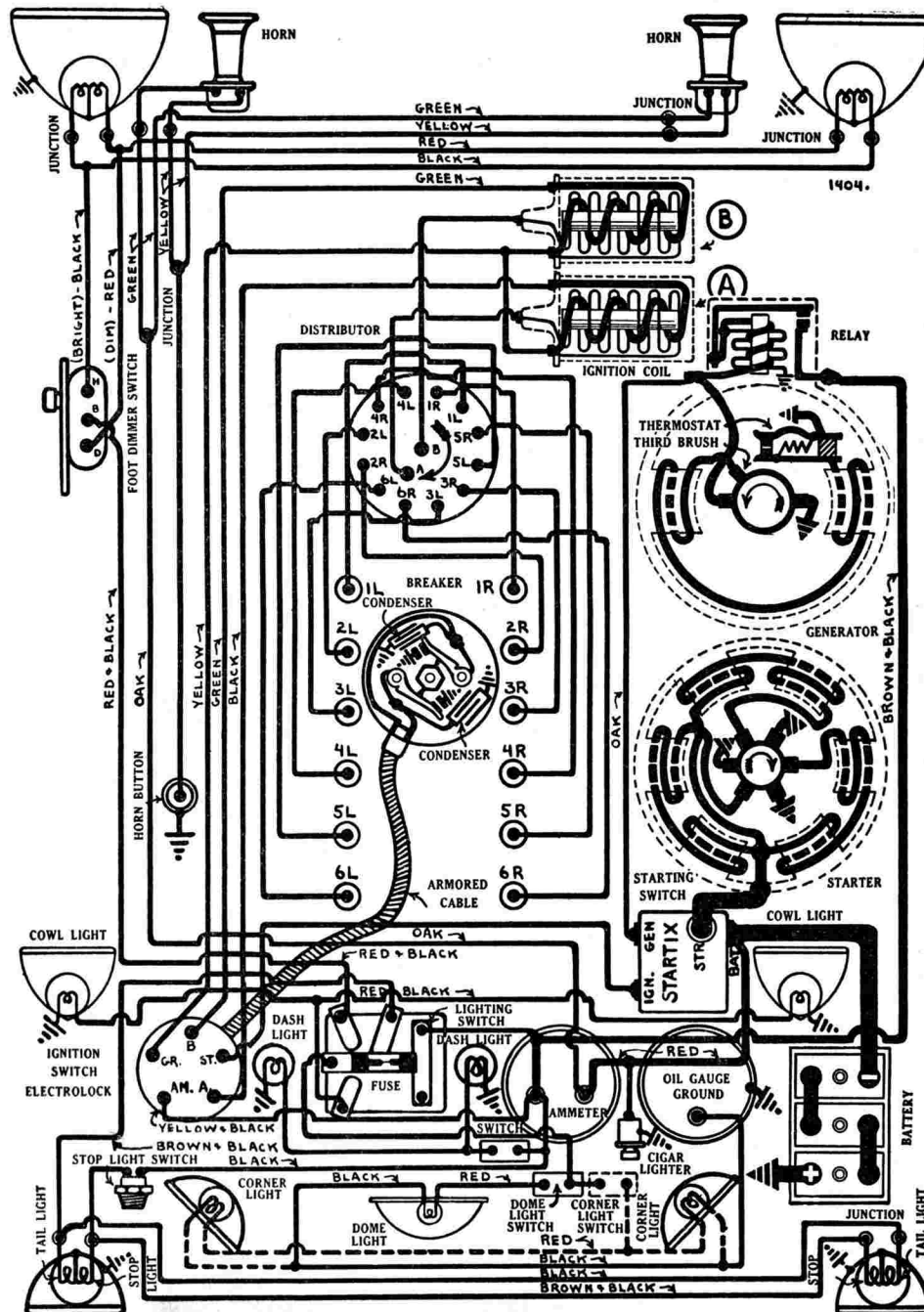
CAR SERIAL NUMBER:—Stamped on plate right hand body sill at front door.
ENGINE NUMBER:—Stamped on right side of crankcase midway of engine.
ENGINE:—Lycoming, Model BB, twelve cylinder, 45 degree 'V' type, modified 'L' head with valves mounted horizontally. Bore and stroke $3\frac{1}{8} \times 4\frac{1}{4}$ ", 391.16 cubic inch displacement, rated at 46.87 H.P., develops 160 H.P. at 3500 R.P.M. Standard compression ratio 5.75-1. Optional low compression ratio 5.5-1.
BATTERY:—U.S.L., Type XY-17A, 6 volt, 17 plate, 121 ampere hour capacity (5 ampere rate). Starting capacity 136 amperes for 20 minutes.
Grounded Terminal:—Positive (+) terminal grounded to frame.
Mounting:—On outside of right hand frame side rail under front fender.
Dimensions:—Width, $7\frac{1}{4}$ ". Length, $11\frac{5}{16}$ ". Height, $8\frac{5}{8}$ ".
IGNITION:—Coil Model 528-C (2 used). Coils mounted on bracket on chain case at right hand front corner of engine block.
Ignition Current:—6-3 amperes (engine idling), 4.6 amperes at 6 volts (engine stopped) for each coil.
Ignition Switch:—Type 15-SD Electrolock. Assembled as unit with distributor with both breaker leads protected by an armored cable (see Equipment Section). Switch has two 'on' positions. First 'on' position with key turned to left is timing position with Startix inoperative. Second 'on' position with key turned to right is regular running position with Startix operative.
Distributor Model 667-Z. Two-breaker arm, 6-lobe cam type with semi-automatic advance. Breaker contacts open alternately at $22\frac{1}{2}$ and $37\frac{1}{2}$ degree intervals (corresponding to engine firing intervals of 45 and 75 degrees—engine has blocks set at 45 degree angle and fires at unequal intervals). Contacts must be synchronized (see Timing).
Manual Advance:— 25° (engine) maximum.
Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.024".
Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start	300	600		
20-22	10-11	1600	3200		

Mounting:—Distributor mounted at right front of engine between cylinder banks. Electrolock must be removed with distributor as a unit (see Equipment Section for directions on disconnecting Electrolock). To remove distributor, disconnect ignition wires and free Electrolock at dash, take off distributor cap, take out hold-down screw in advance arm, lift out distributor and Electrolock.
Oiling:—1000 Miles. Turn down grease cup on side of shaft housing one turn. Keep cup filled with medium cup grease. Take off distributor cap and rotor. Put one drop oil on breaker arm pivot pins. Fill wick oiler in center of shaft with light oil. Apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting 11° or 3.21 teeth (on flywheel) before top dead center with manual spark control fully advanced. To set timing, remove cover plate over inspection hole in flywheel housing, fully advance manual spark control. With No. 1 piston (right hand block) on compression stroke, turn engine over until a point on flywheel 3.21 teeth before the top dead center mark for piston No. 1R is directly opposite indicator on flywheel housing. Take off distributor cap, loosen advance arm clamp bolt, rotate distributor cup until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp). Tighten clamp bolt, connect spark plugs as indicated on diagram.

Synchronization of Contacts—first method as part of timing operation. After timing distributor (above), turn crankshaft over 45° to firing position of piston No. 6L (no marks are provided for synchronization but firing position can be determined by counting off 14 teeth on the flywheel from firing position of piston No. 1R), loosen lock screws on movable sub-plate



AUBURN

MODEL 12-161 (1933), SERIAL NUMBERS 12-161-1001 UP
SALON MODEL 12-165 (1933), SERIAL NUMBERS 12-165-1001 UP
DELCO-REMY SYSTEM

(carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws, check contact gap.

Second Method. Synchronize contacts on a rotary spark gap, setting intervals so that movable contacts open 22½ degrees after fixed contacts, with fixed contacts opening again after a 37½ degree interval.

Firing Order:—1L-2R-5L-4R-3L-1R-6L-5R-2L-3R-4L-6R with cylinder banks right (R) and left (L) as viewed from driver's seat. No. 1 cylinder nearest the radiator. Connect spark plugs as shown on diagram.

Spark Plugs:—18 MM. Champion Type C-7. Set gap at .025 inch.

VALVE TIMING:—Valves mounted horizontally between cylinder banks operated through vertical rocker arms from single camshaft directly above crankshaft. Tappet adjustment on upper end of rocker arm. Valves may be removed by taking off secondary plate on head carrying spark plugs without disturbing main cylinder head. Camshaft chain driven from crankshaft in tandem with generator sprocket. Chain adjusted manually by shifting generator (see Generator Mounting).

To Check Valve Timing. Set tappet clearance intake valve No. 1 cylinder, right hand bank, at .015" (cold). With No. 6 piston right hand bank on compression stroke, turn engine over until piston reaches top dead center with flywheel mark for pistons 1R and 6R at indicator on flywheel housing. No. 1R intake valve should open at this point. Reset tappet clearance at .006-.008" with engine hot.

Valve Specifications

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 21/32" (1 27/32" overall)	3410"	5 1/64"	30°	11/32"
Exhaust	1 17/32"	3410"	5 1/64"	30°	11/32"

Tappet Clearance

	Operating	Timing	Spring Pressure
Intake	.006-.008" (hot)	.015" (cold)	Closed .....46-51 pounds (2 3/16")
Exhaust	.006-.008" (hot)	.015" (cold)	Open .....92-97 pounds (1 27/32")

Intake Valves

	Timing	Exhaust Valves
At top dead center.	Open—50° before lower dead center.	
Close—45° after lower dead center.	Close—10° after top dead center.	

CARBURETION:—Stromberg Downdraft Carburetor, Model EX-2. One carburetor is used for each engine bank and carburetor throttles are interconnected (see Carburetor Section for complete data).

Fuel Pump:—Stewart-Warner mechanical type fuel pump mounted at left hand front of engine and driven by eccentric on camshaft (see Equipment Section for complete data).

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model 543.6. Starter drives engine through reduction gears and Bendix drive. Rotation (armature shaft) clockwise at commutator end. Brush spring tension 36-40 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2200	5.7	70
35 "	Lock	3.0	600

Startix:—This model equipped with Startix automatic starting switch (see Equipment Section for complete article on Startix). Not necessary to disconnect Startix when timing engine if special timing position of ignition switch is used (turn ignition key to left).

Mounting:—Starter flange mounted at right of engine on front face flywheel housing. To remove, disconnect cable, take out flange mounting screws, pull starter forward to clear Bendix, lift from place.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in drive end bearing oiler. Commutator end bearing oilless.

Six Months. Take out grease plug in reduction gear case. Repack gears with graphite grease.

GENERATOR:—Model 931-E, F. Third brush regulation, thermostat control. Thermostat operates at 165°F. (contacts open, cuts in resistance) reducing output approximately 40%. Rotation is counter-clockwise at commutator end. Maximum charging rate is 22 amperes (cold) at 8.6 volts reached at 1400 R.P.M.

Charging Rate Adjustment. Loosen locking screw on endplate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
21-23	8.4-8.8	1400	10-13	7.4-7.8	1500-1700

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—3.5-4.0 amperes at 6 volts across field terminals.

NOTE:—Model 931-F generator is fitted with tachometer drive.

Mounting:—Generator flange mounted at right of engine on rear face of timing chain case. To remove, disconnect lead, take off nuts on 3 flange mounting bolts, pull generator out, being careful not to disturb intermediate plate carrying generator sprocket.

Chain Adjustment. Loosen flange mounting bolts, pull generator away from engine, tighten mounting bolts. With correct adjustment chain should operate noiselessly. If chain hums, back off adjustment slightly.

Oiling:—1000 Miles. Put 4-5 drops light engine oil in each oiler (2 oilers).

RELAY:—Model 265-G. Mounted on generator. Relay contacts close with generator voltage of 6.75-7.5 volts and open with discharge current of 0-2.5 amperes. Contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

LIGHTING:—Soreng-Manegold Switch, Model 5670-A. Lighting switch mounted on back of instrument board controlled by push-pull button on lower left center instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated dimmer switch. Dimmer switch is Delco-Remy Model 465-W.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Side (cowl) Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome and Corner Light	6-8	6	S.C.	81

NOTE:—Stop and tail light is combination double filament bulb. Connect tail light lead (brown and black) wire to 2 cp. filament.

FUSES:—20 ampere capacity Type 4AG fuse mounted on back of lighting switch.

HORNS:—Klaxon Model K-26, Type 1393 (low note), Type 1394 (high note), matched tone twin horns are standard equipment. Current draw 6.0-8.5 amperes at 6.0 volts (Type 1393), 5.0-6.5 amperes at 6.0 volts (Type 1394).

AUSTIN

BANTAM MODEL (1933) AFTER MOTOR NUMBER L-15038

AUTO-LITE SYSTEM

ENGINE:—Four cylinder, 'L' head type, 2.2x3" bore and stroke, 45.6 cubic inch displacement, rated at 7 H.P., develops 13 H.P. at 3100 R.P.M. Compression ratio 5-1 (before engine No. L-15038), 6-1 (after engine No. 15038). Compression pressure 97 pounds.

BATTERY:—U.S.L., Type 3-CYX-4X-7A, or XY-9A, 6 volt, 9 plate, 58 ampere hour capacity (5 ampere hour rate). Starting capacity 68 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded.

Mounting:—In recess in cowl under engine hood.

Dimensions:—Width, 7". Length, 6 15/16". Height, 8 5/8".

IGNITION:—Coil Model IG-4065. Coil is mounted on engine side of dash.

Ignition Current:—3 amperes at 6.5 volts (engine running), 4 amperes at 6.4 volts (engine stopped).

Ignition Switch:—Incorporated in lighting switch on instrument panel.

Distributor Model IGB-4034-A. Single breaker, 4-lobe cam, full automatic advance type. Breaker contacts adjusted by loosening lock nut on stationary contact mounting stud and turning up stud.

Breaker Gap:—Set contact gap at .018". Hold within limits of .018-.020".

Breaker Arm Spring Tension:—16-20 ounces measured at tip of breaker arm with spring scale at right angles to back of arm.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0.....	Start.....		300.....		600
4.....	2.....		500.....		1000
8.....	4.....		700.....		1400
12.....	6.....		900.....		1800
16.....	8.....		1100.....		2200
22.....	11.....		1400.....		2800

Mounting:—Mounted on commutator end of generator at left front of engine. To remove, disconnect breaker lead, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

Oiling:—500 Miles. Put 4-5 drops light engine oil in oiler on side of shaft.

1000 Miles. Take off distributor cap and rotor, put one drop oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting .010-.012" (piston) before top dead center.

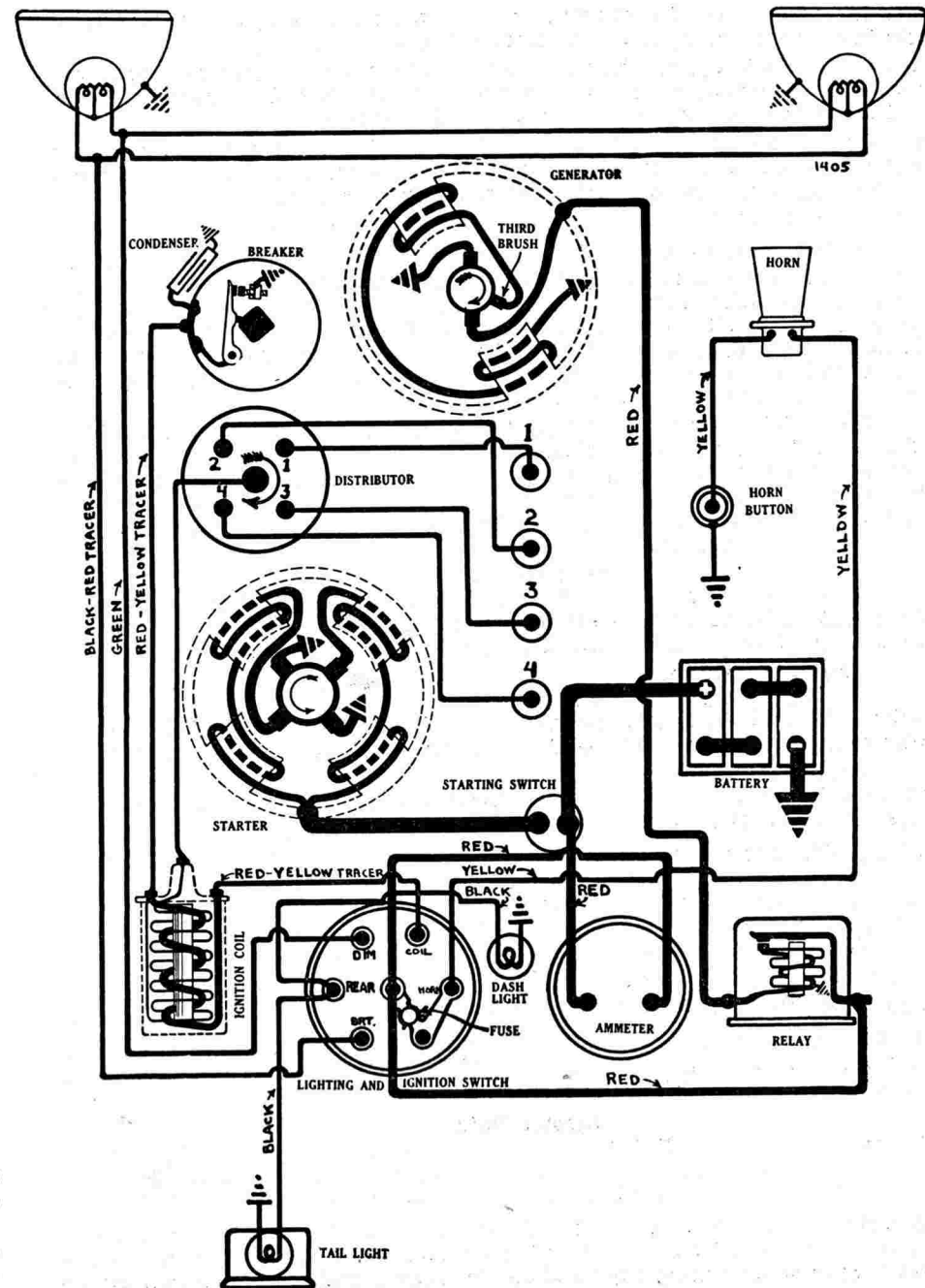
To Set Ignition Timing. Remove spark plug in No. 1 cylinder and install regular timing gauge in spark plug port. With No. 1 cylinder on compression turn engine over by hand until gauge reading is .010-.012" before top dead center, loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated (see Equipment Section for complete data on Timing Gauge).

Firing Order:—1-3-4-2. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set gaps at .025".

VALVE TIMING:—Camshaft Setting. Camshaft is driven from the crankshaft by a spiral gear. Gears are marked. Mesh marked teeth on crankshaft gear between the two marked teeth on the camshaft gear.

To Check Valve Timing:—Check tappet clearance of No. 1 intake valve and set at .006" if necessary. With piston No. 4 on compression turn engine over by hand until piston reaches top dead center (determine top dead center by flywheel mark or use regular timing gauge installed in No. 1 cylinder). No. 1 intake valve should begin to open at this point.



AUSTIN

BANTAM MODEL (1933) AFTER MOTOR NUMBER L-15038

AUTO-LITE SYSTEM

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 1/32"	9/32"	3 1/8"	45°	5/32"
Exhaust	1 1/32"	9/32"	3 1/8"	45°	5/32"

Tappet Clearance

Intake and Exhaust.....006"
Allowable variation—.001" plus
or minus.

Valve Springs

Spring pressure.....45 pounds

Intake Valves

Open—At top dead center.
Close—40° after lower dead center.

Timing

Open—45° before lower dead center.
Close—15° after top dead center.

Exhaust Valves

NOTE:—A new valve spring with one less coil is used beginning with Engine No. L-15055. These springs are made from Swedish steel.

CARBURETION:—Tillotson Vertical or Updraft Carburetor, Type M, Model 10-A (see Carburetor Section for complete data).

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model MAK-4001. Starter drive—Special Outboard Bendix. Starter switch Model SW-4001 is mounted on upper toeboard. Starter rotation counter-clockwise at commutator end. Brush spring tension 38-61 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
.3 lb. ft.	3240	5.5	100
1.3 "	1880	5.0	200
3.1 "	1000	4.5	300
4.8 "	220	4.0	400
7.0 "	Lock	4.0	520

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect cable, take out two flange mounting cap screws, pull starter forward to clear Bendix drive, lift out.

Oiling:—5000 Miles. Put 5-6 drops of light engine oil in starter oilers.

GENERATOR:—Model GAS-4101. Third brush regulation. Rotation is clockwise at commutator end. Maximum charging rate is 14 amperes at 8 volts reached at 1925 R.P.M. or 28-30 M.P.H.

Charging Rate Adjustment. Take off commutator cover band, shift third brush by prying on brush mounting stud, clockwise to increase, or counter-clockwise to decrease charging rate. Third brush mounting plate is held in position by friction.

Generator Data

Amperes	Volts	R.P.M.
2	6.6	835
6	7.1	1000
10	7.25	1260
14	8.0	1925
12	7.75	2900

Brush Spring Tension:—15-20 ounces on each brush.

Field Current:—3.80-4.18 amperes at 6.0 volts across field terminals.

Motoring:—4.50-4.80 amperes at 6.0 volts (without distributor).

Mounting:—Flange mounted at left front of engine and driven by helical gears from the camshaft gear. Gear mesh is determined by the number of shims under the generator mounting bracket and these must be carefully replaced when generator is replaced on engine. Distributor is mounted on commutator end of generator. To remove generator, disconnect all wiring or take off distributor, take out three flange mounting bolts, pull generator left to disengage drive gear, lift out.

Gear Adjustment:—An adjustment is provided to mesh the generator drive gear and this should be done whenever the generator is taken off the car. With the engine running, the three screws and the nut on the stud which hold the generator mounting bracket on the crankcase should be loosened slightly and the weight of the generator supported by hand at the commutator end until gears assume correct running position. The mounting screws and nut should then be tightened.

Oiling:—10,000 Miles. Drive end bearing is packed with grease and is oiled from the crankcase. This bearing and the pocket behind the bearing should be packed with Superla 4X grease whenever generator is disassembled. The grease pocket in the commutator end should be refilled with No. 3 Keystone grease yearly or at 10,000-mile intervals.

RELAY:—Model CB-4008. Relay is mounted on the dash. Contacts close at 10 M.P.H. or 875 R.P.M. when generator voltage reaches 7-7.5 volts with a charging current of approximately 2 amperes and open at 6-7 M.P.H. or 600-650 R.P.M. with a discharge current of .5-2.5 amperes.

Contact Gap:—.025-.035". **Air Gap:**—.010-.030" with contact closed.

LIGHTING:—Briggs & Stratton Switch, Model 50518. Lighting switch is mounted on instrument board. Headlights are fitted with double filament bulbs for 'depressed beam' dimming.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	21-21	D.C.	1110
Instrument Light	6-8	3	S.C.	63
Tail Light	6-8	3	S.C.	63

FUSES:—20 ampere capacity lighting fuse mounted on back of lighting switch.

BUICK

MODEL 33-50 (1933)

DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On plate on right hand frame side rail under front fender.

ENGINE NUMBER:—Stamped on right side upper crankcase wall above oil filler.

ENGINE:—Eight cylinder, 'I' head overhead valve type, 2 15/16x4 1/4" bore and stroke, 230.4 cubic inch displacement, rated at 27.61 H.P., develops 86 H.P. (standard high compression) or 83 H.P. (optional low compression) at 3200 R.P.M. Standard compression ratio 5.25-1. Optional low compression ratio 4.84-1. Compression ratio changed by installing special thick head gasket with steel insert using same cylinder head. High compression engines may be identified by red washer under terminals on spark plugs. Plugs must be changed when compression ratio is changed and special plug gaps used (see Spark Plugs). Standard compression pressure, 114 pounds. Low compression, 102 pounds.

BATTERY:—Delco, Type 13-JW, 6 volt, 13 plate, 98 ampere hour capacity (20 hour rate). Starting capacity 117 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—Battery under right hand front seat.

Dimensions:—Width, 7". Length, 9 1/16". Height, 9 3/8".

IGNITION:—Coil Model 528-H. Coil mounted on timing gear case at right front of engine.

Ignition Current:—2.75 amperes at 6.8 volts (engine running), 4.0 amperes at 5.9 volts (engine stopped).

Ignition Switch:—Oakes 'Hershey' type co-incidental ignition switch and steering post lock.

Distributor Model 661-L. Single breaker arm, 8 lobe cam, semi-automatic advance type. Spark control button on dash retards distributor 24° (engine) when pulled out for hand cranking or heavy pulling. With button pushed in (normal running position), the hold-down screw in advance arm should be at the rear of the slot. No synchronization of contacts required.

Breaker Gap:—Set contact gap at .015". Hold within limits of .0125-.0175". To set gap, loosen lock screw on stationary contact mounting plate, turn eccentric adjusting screw, tighten lock screw.

Breaker Arm Spring Tension:—19-23 ounces (measured at point directly behind contacts with spring scale at right angles to back of breaker arm).

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
3.5	Start	250	500		
14	7	400	800		
21	10 1/2	800	1600		

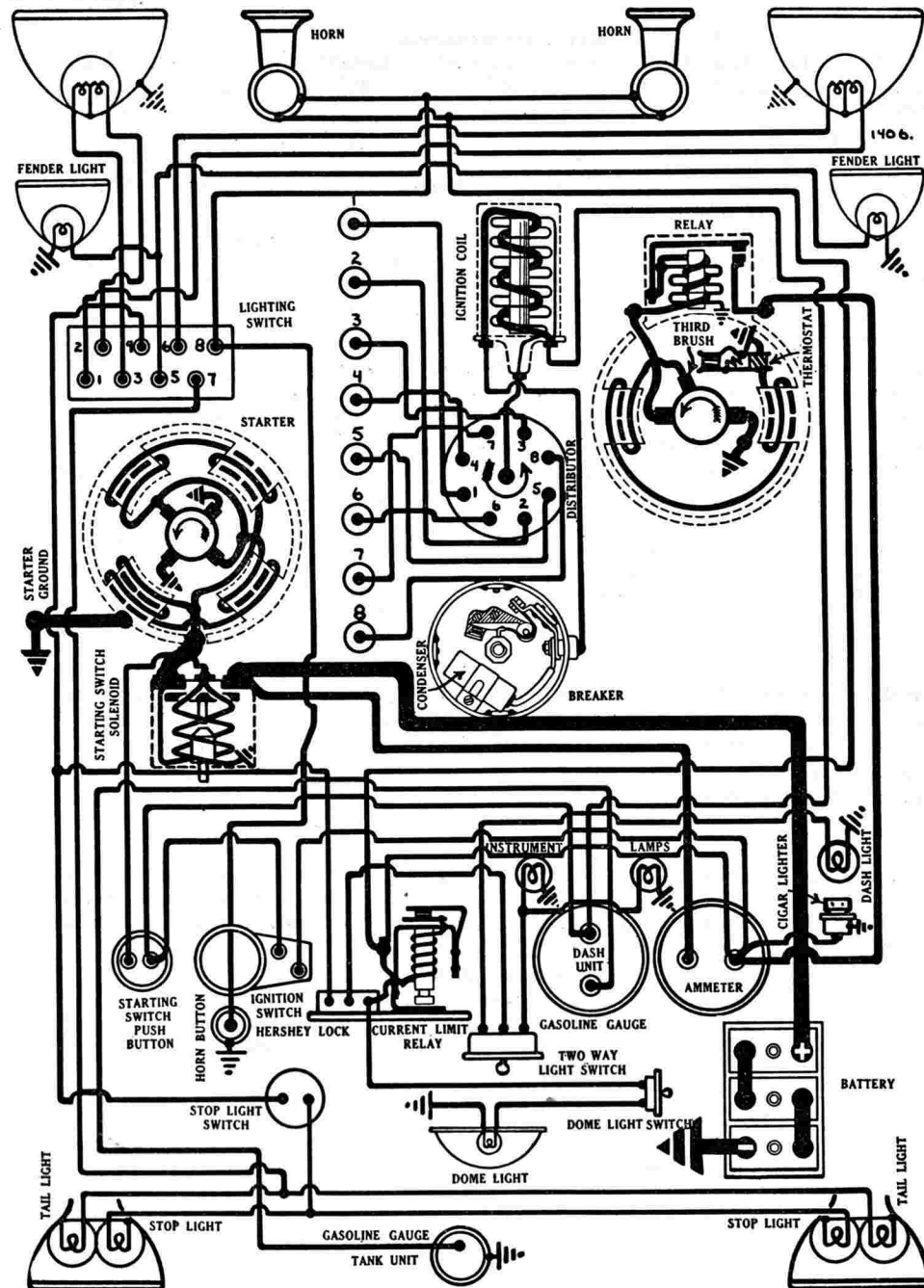
Mounting:—Distributor mounted on commutator end of generator at right front of engine. To remove, disconnect primary lead, disconnect manual advance control, take off distributor cap, take out hold-down screw in advance arm, lift out.

Oiling:—1000 Miles. Fill Zerk fitting on shaft housing using Zerk gun and grease until grease appears at overflow directly above fitting.

2000 Miles. Take off distributor cap and rotor. Fill wick oiler in center of shaft with light engine oil, oil breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard Setting, 7° before top dead center with manual spark control advanced.

To Set Ignition Timing:—Set breaker contact gap at .015", advance manual spark control button (push button in toward dash) and see that distributor hold-down screw is against rear end of advance arm slot, take off cover plate over inspection hole in right hand side of flywheel housing. With No. 1 piston on compression, turn engine over until No. 3 exhaust valve begins to open and stop when flywheel mark 'ADV' registers with reference line on edge of inspection hole. Loosen advance arm clamp bolt, turn distributor so that terminal faces front of car, then rotate distributor clockwise until contacts begin to open, tighten clamp bolt. See that rotor is directly opposite No. 1 terminal in distributor cap (see diagram), if it is not, take out hold-down screw in advance arm, lift distributor to disengage gears, turn distributor shaft to proper position, re-engage gears and replace hold-down screw, repeat timing. Connect spark plugs as indicated on diagram.



BUICK

MODEL 33-50 (1933)

DELCO-REMY SYSTEM

Synchronization of Contacts:—No synchronization required.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—Standard (High) Compression Engines—18 MM. Metric. A.C. Type H-9. Set spark plug gaps at .020-.025 inch. Plugs may be identified by red washer under terminal. On cars with radio use Type 'Radio H-9' with built-in resistor and set gaps at .018-.023 inch.

Low Compression Engines:—18 MM. Metric. A.C. Type J-12. Set gaps at .025-.030 inch. On cars with radio use Type 'Radio J-12' with built-in resistor and set gaps at .018-.023 inch.

VALVE TIMING:—Camshaft Setting. Valves in cylinder head operated by rocker arm on head and pushrods at right of engine with tappet adjustment on rocker arm directly above pushrod. Camshaft gear driven from crankshaft. Camshaft gear (Textolite) and crankshaft gear (steel) are marked. Mesh gears so that marked tooth is opposite marked space.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 15/32" (1 5/16" clear)	.3407-.3417"	45°	.340"
Exhaust	1 11/32" (1 3/16" clear)	.3403-.3411"	45°	.340"

Tappet Clearance or Lash

Intake and exhaust—.008" (hot). Set with engine warmed up and idling.

Valve Springs

	Inner Spring	Outer Spring	Total Pressure
Closed	10-15 pounds—1 13/16"	35-40 pounds—1 15/16"	45-55 pounds
Open	36-42 pounds—1 15/32"	96-103 pounds—1 19/32"	132-145 pounds

Outer spring has two closed coils which must be installed at the bottom. These springs used for service on 1931-32 cars but only on cars with cop-plated valve lifter rollers.

Timing

Intake Valves	Exhaust Valves
Open—4½° before top dead center	Open—58° before lower dead center
Close—54° after lower dead center	Close—30° after top dead center

These opening and closing points are 'timing points' indicating effective opening and closing points with valve .004" off seat with tappet clearance or lash of .008".

CARBURETION:—Marvel Updraft Dual Carburetor Model ED-1-S (see Carburetor Section for complete data). Intake manifold heat control is automatic.

Air Cleaner:—A.C. oil-wetted wire mesh type. Remove at 2500-mile intervals, clean wire mesh by dipping in gasoline, dry thoroughly, re-oil by dipping in engine oil, drain before reassembling.

Fuel Pump:—A.C. Type 'O' Mechanical Fuel Pump (see Equipment Section). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—A.C. Electric type (see Equipment Section).

STARTER:—Model 725-V (725-X R.H. drive). Starter drive, mechanical pinion shift (operated by solenoid mounted on starter field frame) and overrunning clutch (see Equipment Section for complete data). Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces on each brush.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5500	5.0	65
15 "	Lock	3.0	600

Starter Switch:—Push-button switch Delco-Remy, Model 1377. Operating Solenoid Delco-Remy, Model 1502. Can be operated only with ignition switch 'on'.

Mounting:—Two cap screw flange mounting on left hand front face of fly-wheel housing. To remove, disconnect cable and operating lead, take out

two flange mounting screws, pull starter straight forward to clear pinion housing, lift out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in commutator end oiler. Drive end bearing at outer end of pinion housing oilless type.

GENERATOR:—Model 956-B-1 (956-B-3 with distributor). Not interchangeable with previous types. Third brush regulation with thermostat control. Thermostat contacts open at 200°F. reducing generator output approximately 40%. Rotation counter-clockwise at commutator end. Maximum charging rate (standard setting) 18 amperes (cold-summer) or 20 amperes (cold-winter) at 8.5 volts reached at 2000 R.P.M. or approximately 25 M.P.H.

Charging Rate Adjustment:—Take off commutator cover band, loosen small round lock screw on end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.35-8.5	2000	11-14	7.35-7.65	1800-2000

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—2.1-2.5 amperes at 6 volts across field terminals.

Mounting:—Flange mounted on right hand rear face of timing gear case and gear driven from camshaft gear. Distributor mounted on commutator end of generator and water pump driven by generator shaft extension. To remove, disconnect lead and all ignition wiring or remove distributor, disconnect water pump drive coupling, take out flange mounting screws (in front of gear case), pull generator out.

Oiling:—1000 Miles. Fill Zerk fitting on gear case using Zerk gun and grease until grease appears at overflow. Put 8-10 drops light engine oil in commutator end oiler. Drive end bearing oiled by rocker arm shaft overflow.

RELAY:—Model 265-B. Mounted on generator field frame. Contacts close at 8-10 M.P.H. with generator voltage of 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Delco-Remy Switch, Model 487-B (486-R on R.H. drive). Lighting switch mounted at lower end of steering column controlled by lever on steering wheel. Lighting system Guide 'Multibeam' providing special asymmetrical passing beam with standard double filament headlight bulbs. Instrument light switch at lower left hand edge of instrument panel is Model 1364.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Fender Lights	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81
Pillar Lights	6-8	3	S.C.	63

CURRENT LIMIT RELAY:—Model 410-K. Vibrating circuit breaker connected in lighting circuits. Starts with current load of 30-35 amperes limiting load to 5-18 amperes with direct short-circuit.

Contact Gap:—.012-.030 inch. **Air Gap:**—.015-.025 inch (contacts closed).

Spring Tension:—5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

HORNS:—Klaxon Model K-26, Type 1483 (low note), 1484 (high note), matched set (right hand horn—high note, left hand horn—low note). Current draw 5.0-6.5 amperes at 6 volts (Type 1483), 6.0-8.5 amperes at 6 volts (Type 1484).

BUICK

MODEL 33-60, 33-80, 33-90 (1933)

DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On plate on right hand frame side rail under front fender.

ENGINE NUMBER:—Stamped on right side upper crankcase wall directly above generator.

ENGINE:—Eight cylinder, overhead valve type. High compression engines are standard. Compression ratio can be changed to optional low compression by installing special thick cylinder head gasket with steel insert, using same head. High compression engine may be identified by red washer under spark plug terminals. Plugs must be changed and special plug gaps used for low compression (see Spark Plugs).

Model	Comp. Ratio	Bore & Stroke	Displacement	Rated H.P.	Developed H.P.
33-60	5.25-1	3 1/16x4 5/8"	272.6 cu in.	30.02	97 at 3000
33-60	4.84-1	3 1/16x4 5/8"	272.6 cu in.	30.02	91 at 3000
33-80,90	4.8-1	3 5/16x5"	334.8 cu in.	35.12	113 at 3200
33-80,90	4.4-1	3 5/16x5"	334.8 cu in.	35.12	103 at 2900

BATTERY:—33-60—Delco, Type 15-GW, 6 volt, 15 plate, 114 ampere hour capacity (20 hour rate). Starting capacity 137 amperes for 20 minutes.

Dimensions:—Width, 7". Length, 10 9/32". Height, 9 3/32".

33-80, 90:—Delco, Type 17-DW, 6 volt, 17 plate, 130 ampere hour capacity (20 hour rate). Starting capacity 156 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame side rail.

Mounting:—In cradle under right front seat with removable inspection door.

Dimension:—Width, 7". Length, 11 3/4". Height, 9 3/8".

IGNITION:—Coil Model 528-H. Coil mounted on timing gear case at right front of engine.

Ignition Current:—2.75 amperes at 6.8 volts (engine running), 4.0 amperes at 5.9 volts (engine stopped).

Ignition Switch:—Oakes 'Hershey' type co-incidental ignition switch and steering post lock.

Distributor Model 661-K. Single breaker arm, 8 lobe cam, semi-automatic advance type. Spark control button on dash retards distributor 24° when pulled out for hand cranking or heavy pulling. With button pushed in (normal running position), hold-down screw in advance arm should be at rear of slot. No synchronization of contacts required.

Breaker Gap:—Set contact gap at .015". Hold within limits of .0125-.0175".

Breaker Arm Spring Tension:—19-23 ounces (measured directly behind breaker contacts with spring scale at right angles to back of breaker arm).

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
3.5	Start	250	500		
14	7	400	800		
30	15	1300	2600		

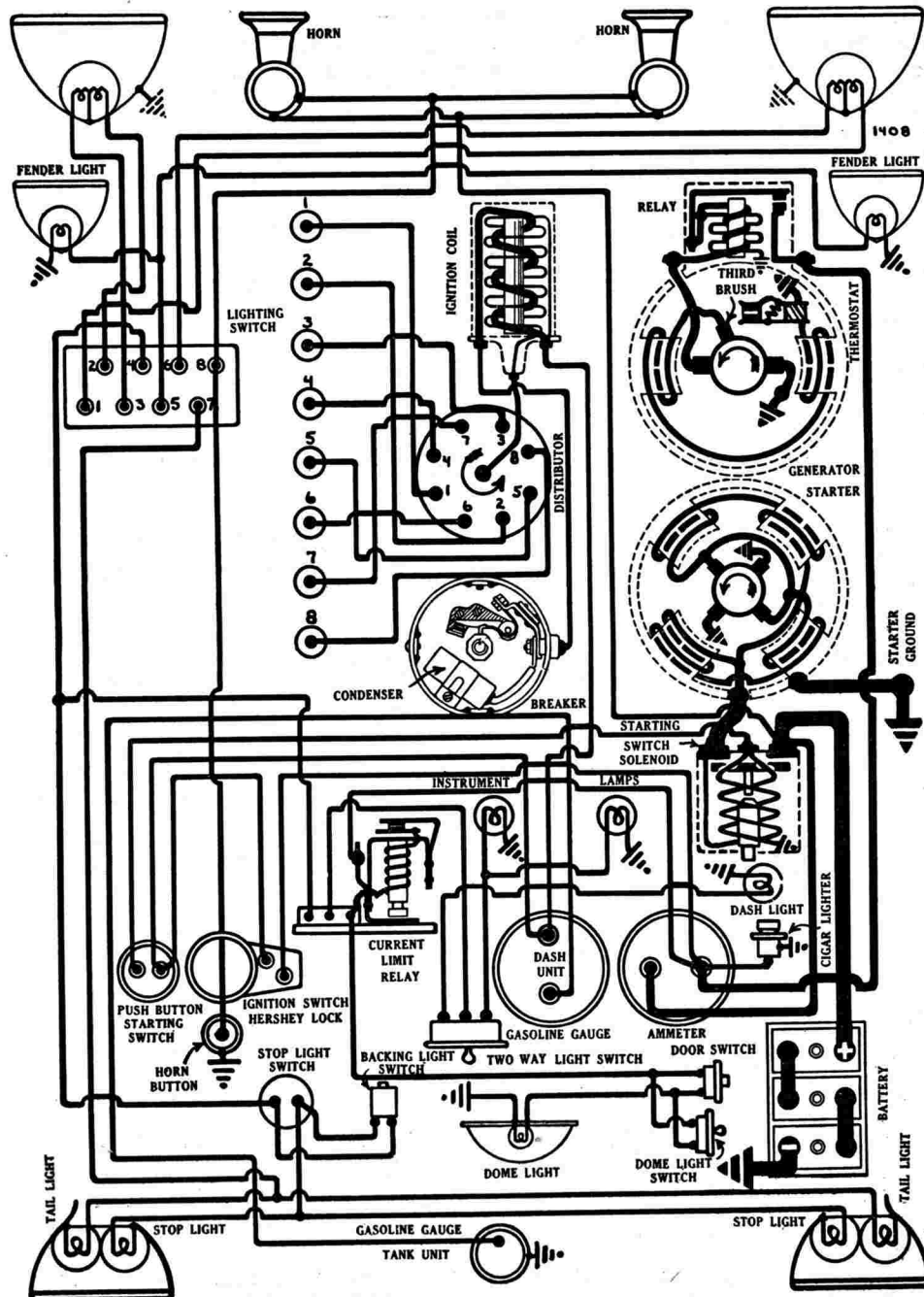
Mounting:—Distributor mounted on commutator end of generator at right of engine. To remove, disconnect primary lead, disconnect manual spark control, take off distributor cap, take out hold-down screw in advance arm, lift out.

Oiling:—1000 Miles. Fill Zerk fitting on shaft housing, using Zerk Gun and grease until grease appears at overflow directly above fitting.

2000 Miles. Take off distributor cap and rotor, fill wick oiler in center of shaft with light engine oil, oil breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard Setting, 11° (33-60), 10° (33-80, 90) before top dead center with manual spark control advanced.

To Set Ignition Timing. Set breaker contact gap at .015", advance manual spark control button (push button in toward dash), see that distributor hold-down screw is against rear end of slot, take off cover plate over inspection hole in top face of right hand rear motor support. With No. 1 piston on compression, turn engine over until No. 3 exhaust valve begins to open and stop when flywheel mark 'ADV.' registers with reference line on edge of inspection hole. Loosen advance arm clamp bolt, turn distributor until terminal faces front of car, then rotate distributor clockwise until contacts begin to open, tighten clamp bolt. See that rotor is opposite No. 1 terminal in distributor cap (see diagram), if it is not, take out hold-down screw in



BUICK

MODEL 33-60, 33-80, 33-90 (1933)

DELCO-REMY SYSTEM

advance arm, lift distributor to disengage drive gears, turn distributor shaft to proper position, re-engage gears and replace hold-down screw, repeat timing. Connect spark plugs as indicated on diagram.

Synchronization of Contacts:—No synchronization required.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 terminal nearest radiator.

Spark Plugs:—Standard (High) Compression Engines—18 MM. Metric. A.C. Type H-9. Set gaps at .020-.025 inch. Plugs may be identified by red washer under terminal. On cars with radio, use Type 'Radio H-9' with built-in resistor and set gaps at .018-.023 inch.

Low Compression Engine:—18 MM. Metric. A.C. Type J-12. Set gaps at .025-.030 inch. On cars with radio, use Type 'Radio J-12' with built-in resistor and set gaps at .018-.023 inch.

VALVE TIMING:—Camshaft Setting. Valves in cylinder head operated by rocker arms on head and pushrods at right of engine with tappet adjustment on rocker arm directly above pushrod. Camshaft gear driven from crankshaft. Camshaft gear (Textolite) and crankshaft gear (steel) are marked. Mesh gear so that marked tooth is opposite marked space between teeth.

Valve Specifications—Model 33-60

Valve	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 9/16" (1 13/32" clear)	.3715-.3725"	45°	.340"
Exhaust	1 7/16" (1 9/32" clear)	.3711-.3719"	45°	.340"

Model 33-80, 90

Intake	1 25/32" (1 5/8" clear)	.3715-.3725"	45°	.340"
Exhaust	1 19/32" (1 7/16" clear)	.3711-.3719"	45°	.340"

Tappet Clearance or Lash

Intake and exhaust—.008" (hot). Set with engine warmed up and idling.

Valve Springs

	Inner Spring	Outer Spring	Total
Closed	20-25 pounds—1 21/32"	35-40 pounds—1 15/16"	45 - 55 pounds
Open	55-61 pounds—1 5/16"	96-103 pounds—1 19/32"	151-164 pounds

Outer spring has two closed coils which must be installed at the bottom. These springs used for service on 1931-32 cars but only on cars with copper plated valve lifter rollers.

Intake Valves

Timing

Exhaust Valves

Open 4 1/2° before top dead center.	Open 58° before lower dead center
Close 54° after lower dead center	Close 30° after top dead center

These opening and closing figures are 'timing points' indicating effective opening and closing points with valve .004" off seat with tappet clearance of .008".

CARBURETION:—Marvel Updraft Dual Carburetor, Model ED-2-S (33-60), ED-3 (33-80, 90). See Carburetor Section for complete data. Intake manifold heat control is automatic.

Air Cleaner:—A.C. Oil-wetted wire mesh type. Remove at 2500 mile intervals, clean wire mesh by dipping in gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Type F combination fuel pump and vacuum pump (see Equipment Section for complete data). Pump mounted at left of engine and driven by pushrod from camshaft on right hand side. Remove sediment bowl under pump when necessary, empty water and sediment, clean filter screen (directly above bowl) before reassembling.

Gasoline Gauge:—A.C. Electric type (see Equipment Section).

STARTER:—Model 725-W. Starter drive, through overrunning clutch and mechanical pinion shift operated by solenoid mounted on starter field frame (see Equipment Section for complete data on starter control). Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5500	5.0	65
16 "	Lock	3.0	600

Starter Switch:—Push button switch, Delco-Remy Model 1377. Operating Solenoid Delco-Remy, Model 1501. Operative only with ignition switch 'on'.

Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, disconnect cable and operating lead, take out 3 flange mounting screws, pull forward to clear pinion housing, lift out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in commutator end oiler. Center bearing and drive end bearing at outer end of pinion housing are both oilless.

GENERATOR:—Model 956-B-1 (956-B-2 with distributor). Not interchangeable with previous types. Third brush regulation with thermostat control. Thermostat contacts open at 200°F. reducing generator output approximately 40%. Rotation counter-clockwise at commutator end. Maximum charging rate (standard setting) 18 amperes (cold-summer) or 20 amperes (cold-winter) at 8.5 volts reached at 2000 R.P.M. or approximately 25 M.P.H.

Charging Rate Adjustment:—Take off commutator cover band, loosen small round lock screw on end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.35-8.5	2000	11-14	7.35-7.65	1800-2000

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—2.1-2.5 amperes at 6 volts across field terminals.

Mounting:—Flange mounted on right hand rear face of timing gear case and gear driven from camshaft gear. Distributor mounted on commutator end of generator and water pump driven by generator shaft extension. To remove, disconnect lead and all ignition wiring or remove distributor, disconnect water pump drive coupling, take out flange mounting screws (in front of gear case), pull generator out.

Oiling:—1000 Miles. Fill Zerk fitting on gear case using Zerk gun and grease until grease appears at overflow. Put 8-10 drops light engine oil in commutator end oiler. Drive end bearing oiled by rocker arm shaft overflow.

RELAY:—Model 265-B. Mounted on generator field frame. Contacts close at 8-10 M.P.H. with generator voltage of 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Delco-Remy Switch, Model 487-B (486-R on R.H. drive). Lighting switch mounted at lower end of steering column controlled by lever on steering wheel. Lighting system Guide 'Multibeam' providing special asymmetrical passing beam with standard double filament headlight bulbs. Instrument light switch at lower left hand edge of instrument panel is Model 1364.

Lamp Sizes

Headlights	6-8	32-32	D.C.	1000
Fender Lights	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Backing and Stop Light	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81
Pillar Lights	6-8	3	S.C.	63

CURRENT LIMIT RELAY:—Model 410-K. Vibrating circuit breaker connected in lighting circuits. Starts with current load of 30-35 amperes limiting load to 5-18 amperes with direct short-circuit.

Contact Gap:—.012-.030 inch. **Air Gap:**—.015-.025 inch (contacts closed).

Spring Tension:—5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

HORNS:—Klaxon Model K-26, Type 1483 (low note), 1484 (high note), matched set (right hand horn—high note, left hand horn—low note). Current draw 5.0-6.5 amperes at 6 volts (Type 1483), 6.0-8.5 amperes at 6 volts (Type 1484).

CADILLAC

V-8 MODEL 355-C (1933), SERIAL NUMBERS 3,000,001 UP
DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—Same as engine number.

ENGINE NUMBER:—Stamped on right side of crankcase below water inlet.

ENGINE:—Eight cylinder 90 degree 'V', 'L' head type, $3\frac{3}{8} \times 4\frac{15}{16}$ bore and stroke, 353 cubic inch displacement, rated at 36.45 H.P., develops 115 H.P. at 3000 R.P.M. Standard compression ratio 5.4-1. Optional high compression ratio of 5.7-1 and low compression ratio of 5.2-1 are available. When installed at factory to compensate for fuel characteristics or altitude conditions the standard ignition setting is used. Standard compression pressure 104 pounds at 1000 R.P.M.

BATTERY:—Delco, Type 17-CF, 6 volt, 17 plate, 130 ampere hour capacity (20 hour rate). Starting capacity 156 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—On outside of frame under right hand front fender.

Dimensions:—Width, 7". Length, $11\frac{3}{4}$ ". Height, $9\frac{3}{8}$ ".

IGNITION:—Coil Model 528-G. Coil is mounted on dash under cowl.

Ignition Current:—5-2 amperes (engine idling), 2 amperes (engine stopped).

Ignition Switch:—Delco-Remy Dual-lock Model 426-T co-incidental ignition switch and transmission lock (see Equipment Section).

Distributor Model 662-Y. Two-breaker, 4-lobe cam, full automatic advance type. Breaker contacts open alternately at 45° intervals corresponding to the 90° firing interval of the engine. Contacts must be synchronized (see Timing).

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Degrees	Automatic Advance		R.P.M.
Engine	Distributor	Distributor	Engine
2	Start	250	500
7.5	3.75	500	1000
11	5.5	800	1600

Mounting:—Distributor is mounted at front of engine between cylinder banks. Driven by gears from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out two cap screws in distributor bracket, lift distributor out.

Oiling:—1000 Miles. Use Alemite grease and gun on Alemite fitting under distributor until grease appears at relief hole above fitting. Take off distributor cap and rotor. Put light oil on breaker arm pivot pins and fill wick oiler in center of shaft. Apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting $9^\circ 12'$ (flywheel) or $.039"$ (piston) before top dead center. To set timing, remove cover plate on flywheel housing. Center distributor pointer on quadrant scale by loosening hold-down screw in pointer arm and rotating distributor cup, tighten hold-down screw. With No. 1 piston (right hand block) on compression stroke rotate crankshaft until flywheel mark 'IG/A-1' is directly opposite indicator on flywheel housing. Loosen advance arm clamp bolt, rotate distributor cup until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp). Tighten clamp bolt, connect spark plugs as indicated on diagram.

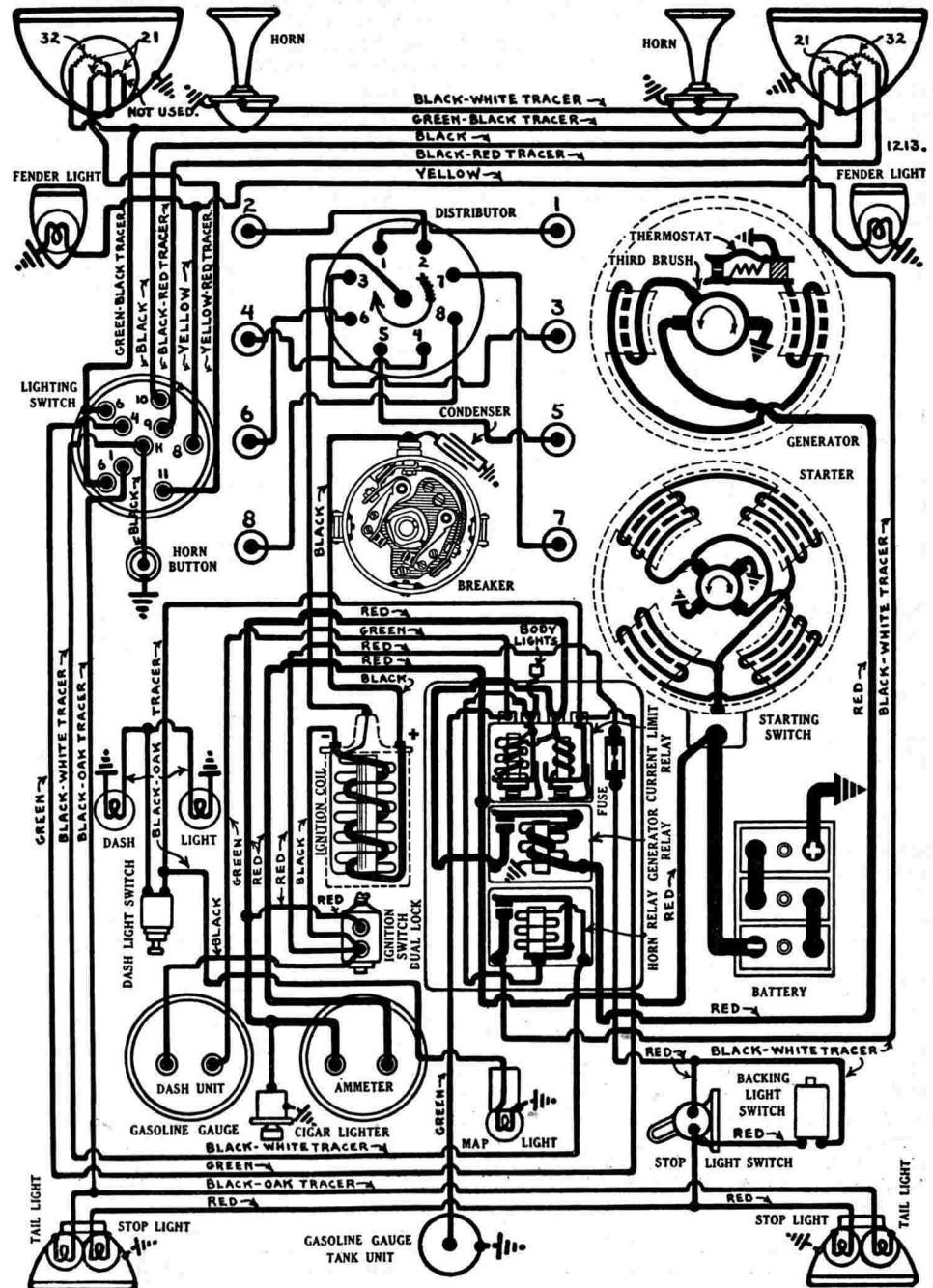
Synchronization of Contacts—first method as part of timing operation. After timing has been completed (as above), turn crankshaft 90 degrees to firing position of piston No. 2 when flywheel mark 'IG/A-2' should be opposite indicator. Loosen two lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws. Check contact gap; if outside limits of .018-.022 inch, reset at .020 inch and repeat synchronization.

Second Method—using synchronizing tool. Use Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section.

Firing Order:—1-2-7-8-4-5-6-3 with cylinders numbered as shown on diagram, or 1R-1L-4R-4L-2L-3R-3L-2R with cylinder banks right (R) and left (L) as viewed from the driver's seat. No. 1 cylinder nearest radiator in each case.

Spark Plugs:—18 MM. A.C. Type D-8. Hold gap within limits of .025-.028 inch.

VALVE TIMING:—Camshaft mounted directly above crankshaft driven by two-sprocket non-adjustable chain drive. Valves adjustable at center of engine between cylinder banks. New manifold on 355-B engine requires new location of valves. With valves numbered 1 to 8, beginning at radiator, valves



CADILLAC

V-8 MODEL 355-C (1933), SERIAL NUMBERS 3,000,001 UP
DELCO-REMY SYSTEM

are #1—exhaust, #2—intake, #3—exhaust, #4 and #5—intake, #6—exhaust, #7—intake, #8—exhaust. Both cylinder blocks are identical.

To Set Valve Timing:—Camshaft sprocket and crankshaft sprocket are marked. Chain should be assembled with crankshaft and camshaft turned so that sprocket marks are directly opposite and in line with a straightedge across the shaft centers.

Valve Specifications

	Head Diameter	Stem Diameter	Length	Seat Angle	Life
Intake	1.660-1.666"	3/8"	6 17/32"	30°	23/64"
Exhaust	1.634-1.640"	3/8"	6 1/2"	45°	23/64"

Tappet Clearance

	Valve Springs
Intake	0.004" (hot) Closed 79 pounds (2 1/2")
Exhaust	0.006" (hot) Open 160 pounds (2.148")

Timing

Intake valves open 6 degrees before top dead center. Intake valves close 42 degrees after lower dead center. This applies with .004" tappet clearance.

Exhaust valves open 38 degrees before lower dead center. Exhaust valves close 2 degrees after top dead center. This applies with .006" tappet clearance.

CARBURETION:—Updraft type carburetor, Cadillac make (see Carburetor Section for complete data).

Fuel Pump:—A.C. mechanical type fuel pump operated by eccentric on camshaft (see Equipment Section for complete data).

Gasoline Gauge:—A.C. Electric type (see Equipment Section).

STARTER:—Model 728-P. Manual pinion engagement connected to starting switch lever (not adjustable). Starter drives through reduction gears and an overrunning clutch. Rotation (armature shaft) counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter cranks engine at 80-90 R.P.M.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
28 "	Lock	3.0	600

Mounting:—Starter flange mounted on rear face of flywheel housing at right of transmission. To remove, disconnect cable, disconnect starting pedal linkage, take out 3 flange mounting cap screws, pull starter to rear to clear housing, lift from place.

Oiling:—1000 Miles. Put 8-10 drops light oil in oiler at each end of armature shaft. Outer bearing in pinion housing is oilless.

Six Months. Take out grease plug in reduction gear case. Repack gears with graphite grease.

GENERATOR:—Model 927-S. Third brush regulation, thermostat control. Thermostat contacts open at 175°F. reducing generator output approximately 40%. Rotation is counter-clockwise at commutator end. With standard setting maximum charging rate is 14-17 amperes at 8 volts (hot) reached at 1800 R.P.M. or 22 M.P.H.

Charging Rate Adjustment:—Loosen hexagonal lock screw on endplate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
22-24	8.6-9.0	1450-1650	14-17	7.8-8.2	1800-2000

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—3.5-4.0 amperes at 6 volts across field terminals.

Mounting:—Generator flange mounted at right of engine on rear of accessory drive chain case. Water pump mounted on front of chain case. Driven by special chain from crankshaft. To remove, drop mud pan at right of engine, disconnect lead, take off nuts on two upper flange mounting bolts, take out lower flange mounting cap screw, pull generator to rear to disengage drive coupling, take out from underneath car.

Chain Adjustment. Loosen nuts on flange mounting bolts, loosen two pivot screws (second screw on front of chain case), pull generator away from engine until chain is tight, slack off 1/8 inch, tighten bolts and screws.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler at each end of generator.

RELAY:—See paragraph on 'Apparatus Box'.

LIGHTING:—Delco-Remy Switch, Model 486-S or 487-A. Switch is mounted at lower end of steering column controlled by lever on steering wheel. Lighting system new Cadillac 'Super-Safe' system equipped with new type three-filament bulbs Mazda No. 3001 (32-21-21 cp.). Bulbs are interchangeable but are installed in left head lamp with 32 cp. filament at the top and in the right hand head lamp with 32 cp. filament at the bottom. Sockets are designed so that bulb cannot be inserted incorrectly. Headlight doors, lenses and reflectors are not interchangeable, being designed to give a particular pattern of light for each headlamp filament.

SPECIAL NOTE:—As in 'Tilt Ray Depressed Beam' practise, the lower filament gives a higher or farther range of light than the upper filament which is used for the 'depressed beam' or passing light. The 32 cp. filament in the right hand headlight being installed at the bottom gives a high and far-reaching light for country driving. In the left hand headlight this 32 cp. filament is installed at the top and gives a 'depressed' light. The manufacturer recommends in states which prohibit direct light above the horizontal that the 32 cp. filament in the right hand headlight not be used. Insulate wire to No. 3 in headlight plug (black wire with red tracer—tip has shortest shank). Head lamps are aimed so that right hand head lamp points straight ahead, left hand lamp illuminates the right side of the road.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21-21	Triple	3001
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Backing and Stop Lights	6-8	15	S.C.	87
Map Reading Lights	6-8	3	S.C.	63
Dome and Corner Lights	6-8	6	S.C.	81

NOTE:—The map reading light in the center of the instrument panel has a switch built in the socket. Switch is operated by pulling the light out against the stop. To remove map reading lamp bulb, pull lamp out part way until the end of the threaded shaft on the lamp plunger is flush with the end of the cylinder (behind instrument panel), turn bulb shield until the hole in the plunger lines up with the hole in the cylinder, insert a nail to prevent plunger turning, unscrew bulb shield (right hand thread).

APPARATUS BOX:—Delco-Remy, Model 480-Z. Mounted on rear of dash under cowl. Consists of current limit relay (vibrating and lock-out circuit breaker), generator cut-out relay, horn relay, and a 10-ampere capacity fuse (in circuit to backing and stop lights).

Current Limit Relay:—Vibrating circuit breaker begins to operate with current load of 35-40 amperes limiting current to 5-20 amperes maximum with direct short-circuit. Lock-out circuit breaker begins to operate with current load of 25-30 amperes limiting current to less than 1 ampere with direct short-circuit. Circuit breaker contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring tension 5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

Cut-out Relay:—Contacts close at 8-9 M.P.H. or 420 R.P.M. (generator) with a generator voltage of 6.75-7.5 volts and open with a discharge current of 0-2 amperes. Contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

Horn Relay:—Model 266-T. Pressing horn button energizes horn relay winding, closing horn relay contacts and completing horn circuit. Horn current does not pass through horn button. Horn relay requires .25 amperes to close contacts. Horn relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

FUSES:—Backing and stop light fuse mounted in Apparatus Box, 10 ampere capacity.

HORNS:—Klaxon vibrator type matched set with blended note, Model K-22-C Type 1160 (low note) and Model K-22-C Type 1161 (high note). Horns draw 6.0-8.0 amperes at 6 volts each.

CADILLAC

V-12 MODEL 370-C (1933), SERIAL NUMBERS 4,000,001 UP
DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—Same as engine number.

ENGINE NUMBER:—Stamped on right hand side of chain housing directly behind fan.

ENGINE:—Twelve cylinder 45 degree 'V', 'I' or overhead valve type, $3\frac{1}{8} \times 4$ " bore and stroke, 368 cubic inch displacement, rated at 46.9 H.P., develops 135 H.P. at 3400 R.P.M. Standard compression ratio 5.6-1. Optional low compression ratios of 5.4-1 and 4.9-1 are available. When installed at factory to compensate for fuel characteristics or altitude conditions, the standard ignition setting is used. Standard compression pressure 117 pounds at 1000 R.P.M.

BATTERY:—Delco, Type 21-CF, 6 volt, 21 plate, 164 ampere hour capacity (20 hour rate). Starting capacity 195 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—Outside of frame under right hand front fender.

Dimensions:—Width, 7". Length, 13 $\frac{9}{16}$ ". Height, 9 $\frac{3}{16}$ ".

IGNITION:—Coil Model 526-E (2 used). Coils are mounted in recess in radiator top tank directly above distributor.

Ignition Current:—2.5 amperes (engine idling), 4 amperes (engine stopped).

Ignition Switch:—Delco-Remy Dual-lock, Model 426-T co-incidental ignition switch and transmission lock (see Equipment Section for complete data).

Distributor Model 4110. Two-breaker, 6-lobe cam, full automatic advance type. Contacts open alternately at $37\frac{1}{2}$ - and $22\frac{1}{2}$ -degree intervals corresponding to the engine firing intervals of 75 and 45 degrees (this unequal firing interval is caused by 45° included angle between cylinder banks). Contacts must be synchronized (see 'Timing').

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

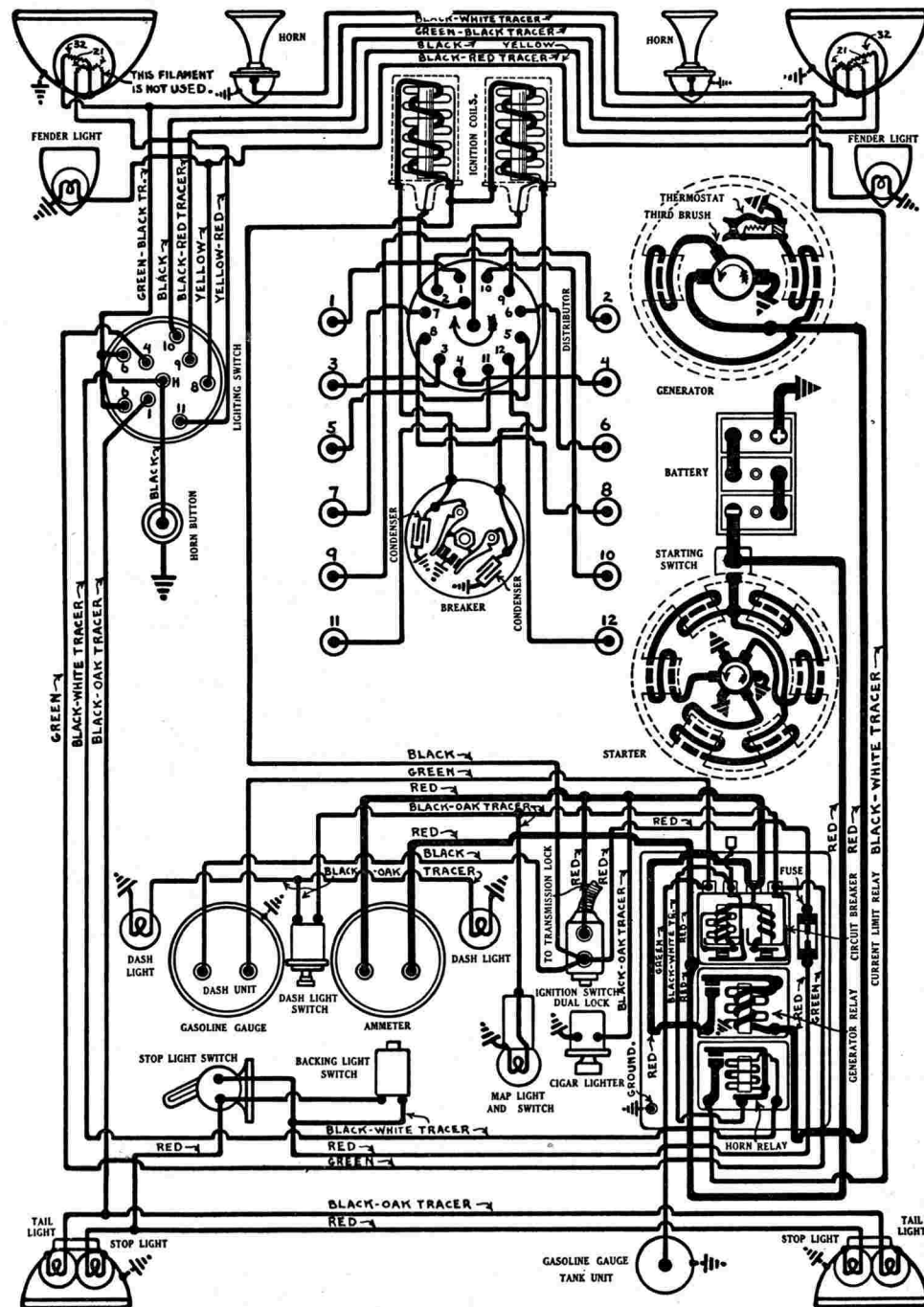
Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
2.5	Start	.....	250	500
42	21	.....	1100	2200

Mounting:—Distributor mounted at front of engine between cylinder banks. Driven by gears from camshaft. To remove, disconnect primary leads, take off distributor cap, take out two mounting screws in distributor bracket, lift distributor out.

Oiling:—1000 Miles. Use Alemite grease in Alemite gun on fitting under distributor until grease appears at overflow above fitting (for lower bearing). Put 8-10 drops light oil in oiler on side of distributor cup (upper bearing). Take off distributor cap and rotor, oil breaker arm pivot pins, put 4-5 drops light oil on top of cam locking screw (oiler for breaker arm rubbing blocks on cam).

IGNITION TIMING:—Standard setting 4° (flywheel), .006" (piston) before top dead center. To set timing, remove cover plate over inspection hole in flywheel housing. Center distributor pointer on quadrant scale by loosening hold-down screw in advance arm and rotating distributor cup, tighten hold-down screw. With No. 1 piston on compression stroke crank engine over until flywheel mark 'C/2-12' appears at inspection hole and stop when mark 'IG/A' (which is 41 degrees after the 'C/2-12' mark) is opposite the indicator on the housing (this is necessary because the 'IG/A' ignition marks are not numbered to indicate the cylinder to which they refer). Then take off distributor cap and rotor, loosen locking screw in center of breaker cam, carefully locate cam so that right hand contacts are beginning to open (use test lamp) with rotor terminal connected to center terminal in distributor head directly opposite No. 1 terminal in head (see diagram), tighten cam locking screw. Connect spark plugs as indicated on diagram (No. 1 terminal as designated).

Synchronization of Contacts—using synchronizing tool, Cadillac Part No. 109224. This tool developed for use on V-16 engines has special markings for use in synchronizing V-12 distributors with unequal firing intervals (see 1931 V-16 diagram in National Service Manual). Install tool and adjust so that right hand (stationary) set of breaker contacts begin to open with pointer on farthest indicating point on quadrant 'RH'. Crank engine over until pointer is directly opposite '12 L.H.' mark on quadrant. Loosen lock



CADILLAC

V-12 MODEL 370-C (1933), SERIAL NUMBERS 4,000,001 UP
DELCO-REMY SYSTEM

screws on movable sub-plate (carrying second set of breaker contacts), turn eccentric adjusting screw until contacts begin to open, tighten locking screws. Right hand contacts should open again when pointer is opposite '12 R.H.' mark on quadrant. These marks are 37½ and 22½ degrees apart, respectively.

Second Method—as part of timing operation. After distributor has been timed to engine (second paragraph above), crank engine over 75 degrees to firing position of piston No. 4 with '1G/A' opposite indicator in inspection hole. Loosen locking screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open (left hand set), tighten locking screws, check contact gap.

Firing Order:—1-4-9-8-5-2-11-10-3-6-7-12 with cylinders numbered as shown on diagram, or 1L-2R-5L-4R-3L-1R-6L-5R-2L-3R-4L-6R with cylinder banks right (R) and left (L) as viewed from driver's seat. No. 1 cylinder nearest radiator in each case.

Spark Plugs:—18 MM. Metric. A.C. Type G-7. Set gaps at .025-.028".

VALVE TIMING:—Camshaft mounted directly above crankshaft driven by silent chain. Chain adjustment automatic. Generator also driven by timing chain. Engine valve-in-head type with valves operated by rocker arms on head and pushrods between cylinder banks. Valve tappet clearance adjustment automatic (see Special Note).

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.446"	11/32"	6 9/64"	45°	11/32"
Exhaust	1.452"	11/32"	6 9/64"	45°	11/32"

Tappet Clearance

No appreciable clearance or lash in service (see Special Note).

Intake Valves

Open—At top dead center.

Close—44° after lower dead center.

Timing

Open—39° before lower dead center.

Close—5° after top dead center.

Spring Pressure

Closed 70 pounds
Open 167 pounds

Exhaust Valves

SPECIAL NOTE:—Special automatic valve tappet take-up is used. Rocker arm is mounted on eccentric bushing which is rotated to take up all valve lash or clearance by a spring under the plunger which bears on an arm of the eccentric. Plunger operates in an oil cylinder or dashpot. This device requires no attention in service and there will be no appreciable tappet clearance or lash. It must be reset when replacing valves by using special combination screwdriver and wrench, Cadillac Part No. 109627-T, and adjusting clearance to .030 inch with plunger held down at the bottom of the dashpot. Adjust with engine running and use special tool, Cadillac Part No. 109624, to hold plunger down at end of stroke.

CARBURETION:—Two Detroit Lubricator Updraft Carburetors, Model 51. One carburetor is used for each cylinder block. Carburetors must be equalized when they are adjusted (see Carburetor Section for complete data).

Fuel Pump:—A.C. mechanical type fuel pump operated by eccentric on camshaft (see Equipment Section for complete data).

Gasoline Gauge:—A.C. Electric type (see Equipment Section).

STARTER:—Model 495. Manual pinion engagement connected to starting switch lever. Starter drives engine through reduction gears and overrunning clutch. Rotation (armature shaft) counter-clockwise at commutator end. Brush spring tension 36-40 ounces. Starter cranks engine at 80-90 R.P.M.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2200	5.7	70
35 "	Lock	3.0	600

Mounting:—Starter flange mounted on rear face flywheel housing at right of transmission. To remove, disconnect cable, disconnect starting pedal linkage, take out 3 flange mounting cap screws, pull starter to rear to clear housing, lift from place.

Oiling:—1000 Miles. Put 8-10 drops light oil in oiler at drive end of armature shaft. Commutator end bearing and pinion housing bearing oilless.

Six Months. Take out grease plug in reduction gear housing, repack gears with graphite grease.

GENERATOR:—Model 931-D. Third brush regulation, thermostat control. Thermostat contacts open at 175°F. reducing generator output approximately

40%. Rotation is counter-clockwise at commutator end. With standard setting, maximum charging rate is 13.5-16.5 amperes at 7.6 volts (hot) reached at 1600 R.P.M. or 23 M.P.H.

Charging Rate Adjustment. Loosen hexagonal headed lock screw on end-plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw. Generator is air cooled and charging rate may be set at 24 amperes (cold—maximum) without danger.

Generator Data

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
22-24	8.6-9.0	1300-1500	13.5-16.5	7.7-8.1	1600-1800

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—3.5-4.0 amperes at 6 volts across field terminals.

Mounting:—Generator flange mounted on rear face timing chain case at right of engine. Driven by timing chain. Chain adjustment automatic, requires no attention during life of chain. To remove, disconnect lead, disconnect water pump drive coupling, take out 3 flange mounting screws, slide generator to rear to disengage coupling, lift from place.

Oiling:—1000 Miles. Put 8-10 drops light oil in oiler at each end of generator.

RELAY:—See paragraph on 'Apparatus Box'.

LIGHTING:—Delco-Remy Switch, Model 486-S or 487-A. Switch mounted at lower end of steering column controlled by lever on steering wheel. Lighting system new Cadillac 'Super-Safe' system equipped with new type three filament bulbs Mazda No. 3001 (32-21-21 cp.). Bulbs are interchangeable but are installed in left head lamp with 32 cp. filament at the top, and in the right hand head lamp with 32 cp. filament at the bottom. Sockets are designed so that bulb cannot be inserted incorrectly. Headlight doors, lenses and reflectors are not interchangeable, being designed to give a particular pattern of light for each headlamp filament.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21-21	Triple	3001
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Backing and Stop Lights	6-8	15	S.C.	87
Map Reading Lights	6-8	3	S.C.	63
Dome and Corner Lights	6-8	6	S.C.	81

APPARATUS BOX:—Delco-Remy, Model 480-Z. Mounted on rear of dash under cowl. Consists of current limit relay (vibrating and lock-out circuit breaker), generator cut-out relay, horn relay, and a 10 ampere capacity fuse (in circuit to backing and stop lights).

Current Limit Relay:—Vibrating circuit breaker begins to operate with current load of 35-40 amperes limiting current to 5-20 amperes maximum with direct short-circuit. Lock-out circuit breaker begins to operate with current load of 25-30 amperes limiting current to less than 1 ampere with direct short-circuit. Circuit breaker contact gap limits, .012-.030 inch. Air gap limits, .015-.025 inch (contacts closed). Spring tension 5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

Cut-out Relay:—Contacts close at 7-9 M.P.H. or 520 R.P.M. (generator) with a generator voltage of 6.75-7.5 volts and open with a discharge current of 0-2 amperes. Contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

Horn Relay:—Model 266-T. Pressing horn button energizes horn relay winding, closing horn relay contacts and completing horn circuit. Horn current does not pass through horn button. Horn relay requires .25 amperes to close contacts. Horn relay contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

FUSES:—Backing and stop light fuse mounted in Apparatus Box, 10 ampere capacity.

HORNS:—Klaxon vibrator type matched set with blended note. Model K-22-C Type 1160 (low note), and Model K-22-C Type 1161 (high note). Horns should draw 6.0-8.0 amperes at 6 volts.

CADILLAC

V-16 MODEL 452-C (1933), SERIAL NUMBERS 5,000,001 UP DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—Same as engine number.

ENGINE NUMBER:—Stamped on right hand side of chain housing directly behind fan.

ENGINE:—Sixteen cylinder 45 degree 'V', 'I' or overhead valve type, 3x4 inches bore and stroke, 452 cubic inch displacement, rated at 57.7 H.P., develops 165 H.P. at 3400 R.P.M. Standard compression ratio 5.7-1. Optional low compression ratios of 5.4-1 and 4.9-1 are available. When installed at factory to compensate for fuel characteristics or altitude conditions the standard ignition setting is used. Standard compression pressure 123 pounds at 1000 R.P.M.

BATTERY:—Delco, Type 25-AF, 6 volt, 25 plate, 196 ampere hour capacity (20 hour rate). Starting capacity 234 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—On outside of frame under right hand front fender.

Dimensions:—Width, 7". Length, 16 3/16". Height, 9 3/16".

IGNITION:—Coil Model 530-K (2 used). Coils are mounted in recess in radiator top tank directly above distributor.

Ignition Current:—2.5 amperes (engine idling), 4 amperes (engine stopped).

Ignition Switch:—Delco-Remy Dual-lock, Model 426-T co-incidental ignition switch and transmission lock (see Equipment Section for complete data).

Distributor Model 4111. Two-breaker, 8-lobe cam, full automatic advance type. Breaker contacts open alternately at 22½-degree intervals corresponding to 45-degree firing interval of engine. Contacts must be synchronized (see Timing).

Breaker Gap:—Set contact gap at .016". Hold within limits of .014-.018".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Engine	Degrees	Distributor	Distributor	R.P.M.	Engine
1.5	Start	250		500	
28	14	1100		2200	

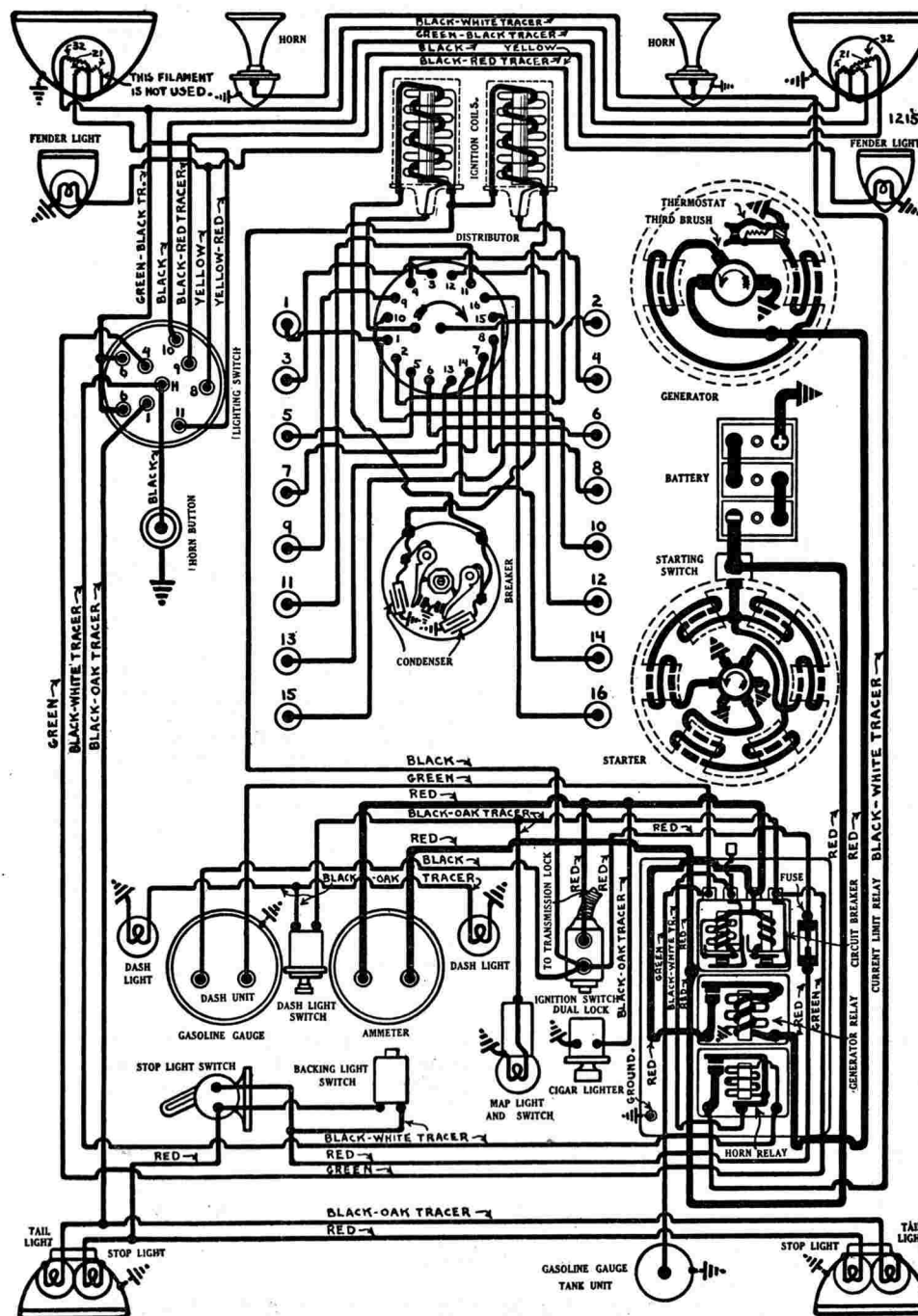
Mounting:—Distributor mounted at front of engine between cylinder banks. Driven by gears from camshaft. To remove, disconnect primary leads, take off distributor cap, take out two mounting screws in distributor bracket, lift distributor out.

Oiling:—1000 Miles. Use Alemite grease in Alemite gun on fitting under distributor cup until grease appears at overflow above fitting (lower bearing). Put 8-10 drops light oil in oiler on side of distributor cup (upper bearing). Take off distributor cap and rotor, put 4-5 drops light oil on top of cam locking screw (oiler for breaker arm rubbing blocks on cam), oil breaker arm pivot pins.

IGNITION TIMING:—Standard setting 4° (flywheel) or .006" (piston) before top dead center. To set timing, remove cover over inspection hole in flywheel housing. Center distributor pointer on quadrant scale by loosening hold-down screw in advance arm and rotating distributor cup, tighten hold-down screw. With No. 1 piston on compression stroke, turn engine over (see note) until flywheel mark 'IG/A' (which is 4° before the dead center mark 'C/1-15') is directly opposite indicator on flywheel housing. Then take off distributor cap and rotor, loosen locking screw in center of breaker cam, carefully locate cam so that first set of breaker contacts (mounted directly on breaker plate) are beginning to open, tighten locking screw. Connect spark plugs as indicated on diagram.

Synchronizing Contacts—using synchronizing tool, Cadillac Part No. 109224. Install tool and adjust so that first set of contacts begin to open with the pointer on farthest indicating point on quadrant 'R.H.' Crank engine over until pointer is directly opposite next graduation on the quadrant 'L.H.' Loosen lock screws on movable sub-plate (carrying second set of breaker contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws. The first set or "stationary" set of contacts should open again when pointer is directly opposite center point on quadrant. These marks are 22½ degrees apart (see illustration on 1931 V-16 wiring diagram).

Second Method—as part of timing operation. After distributor has been timed to engine (second paragraph above), turn engine over 45 degrees to firing position of piston No. 8. Loosen lock screws on movable sub-plate, turn eccentric adjusting screw until contacts begin to open, tighten locking



CADILLAC

V-16 MODEL 452-C (1933), SERIAL NUMBERS 5,000,001 UP
DELCO-REMY SYSTEM

NOTE:—No provision is made for hand cranking of engine. Manufacturer recommends that transmission be engaged, the car jacked up and engine cranked by turning one of the rear wheels.

Firing Order:—1-8-9-14-3-6-11-2-15-10-7-4-13-12-5-16 with cylinders numbered as shown on diagram, or 1L-4R-5L-7R-2L-3R-6L-1R-8L-5R-4L-2R-7L-6R-3L-8R with cylinder banks right (R) and left (L) as viewed from the driver's seat. No. 1 cylinder nearest radiator in each case.

Spark Plugs:—18 MM. Metric. A.C. Type G-7. Set gaps at .025-.028 inch.

VALVE TIMING:—Camshaft mounted directly above crankshaft driven by silent chain. Chain adjustment automatic. Generator also driven by timing chain. Engine valve-in-head type with valves operated by rocker arms on head and pushrods between cylinder banks. Valve tappet clearance adjustment automatic (see Special Note).

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.446"	11/32"	6 9/64"	45°	11/32"
Exhaust	1.452"	11/32"	6 9/64"	45°	11/32"

Tappet Clearance

No appreciable clearance or lash in service (see Special Note).	Closed	70 pounds
	Open	167 pounds

Spring Pressure

Intake Valves	Timing	Exhaust Valves
Open—At top dead center.		Open—39° before lower dead center.
Close—44° after lower dead center.		Close—5° after top dead center.

SPECIAL NOTE:—Special automatic valve tappet take-up is used. Rocker arm is mounted on eccentric bushing which is rotated to take up all valve lash or clearance by a spring under the plunger which bears on an arm of the eccentric. Plunger operates in an oil cylinder or dashpot. This device requires no attention in service and there will be no appreciable tappet clearance or lash. It must be reset when replacing valves by using special combination screwdriver and wrench, Cadillac Part No. 109627-T, and adjusting clearance to .030 inch with plunger held down at the bottom of the dashpot. Adjust with engine running and use special tool, Cadillac Part No. 109624, to hold plunger down at end of stroke.

CARBURETION:—Two Detroit Lubricator Updraft Carburetors, Model 51. One carburetor is used for each cylinder bank. Carburetors must be equalized when they are adjusted (see Carburetor Section for complete data).

Fuel Pump:—A.C. mechanical fuel pump operated by eccentric on camshaft (see Equipment Section for complete data).

Gasoline Gauge:—A.C. Electric type (see Equipment Section).

STARTER:—Model 495. Manual pinion engagement connected to starting switch lever. Starter drives engine through reduction gears and overrunning clutch. Rotation (armature shaft) counter-clockwise at commutator end. Brush spring tension 36-40 ounces. Starter cranks engine at 80-90 R.P.M.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2200	5.7	70
35 "	Lock	3.0	600

Mounting:—Starter flange mounted on rear face flywheel housing at right of transmission. To remove, disconnect cable, disconnect starting pedal linkage, take out 3 flange mounting cap screws, pull starter to rear to clear housing, lift from place.

Oiling:—1000 Miles. Put 8-10 drops light oil in oiler at drive end of armature shaft. Commutator end bearing and pinion housing bearing oilless.

Six Months. Take out grease plug in reduction gear housing, repack gears with graphite grease.

GENERATOR:—Model 931-D. Third brush regulation, thermostat control. Thermostat contacts open at 175°F. reducing generator output approximately 40%. Rotation is counter-clockwise at commutator end. With standard setting, maximum charging rate is 13.5-16.5 amperes at 7.6 volts (hot) reached at 1600 R.P.M. or 24 M.P.H.

Charging Rate Adjustment:—Loosen hexagonal headed lock screw on end-

plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw. Generator is air cooled and charging rate may be set at 24 amperes (cold—maximum) without danger.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
22-24	8.6-9.0	1300-1500	13.5-16.5	7.7-8.1	1600-1800

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—3.5-4.0 amperes at 6 volts across field terminals.

Mounting:—Generator flange mounted on rear face timing chain case at right of engine. Driven by timing chain. Chain adjustment automatic, requires no attention during life of chain. To remove, disconnect lead, disconnect water pump drive coupling, take out 3 flange mounting screws, slide generator to rear to disengage coupling, lift from place.

Oiling:—1000 Miles. Put 8-10 drops light oil in oiler at each end of generator.

RELAY:—See paragraph on 'Apparatus Box'.

LIGHTING:—Delco-Remy Switch, Model 486-S or 487-A. Switch is mounted at lower end of steering column controlled by lever on steering wheel. Lighting system new Cadillac 'Super-Safe' system equipped with new type three filament bulbs Mazda No. 3001 (32-21-21 cp.). Bulbs are interchangeable but are installed in left head lamp with 32 cp. filament at the top, and in the right hand head lamp with 32 cp. filament at the bottom. Sockets are designed so that bulb cannot be inserted incorrectly. Headlight doors, lenses and reflectors are not interchangeable, being designed to give a particular pattern of light for each headlamp filament.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21-21	Triple	3001
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Backing and Stop Lights	6-8	15	S.C.	87
Map Reading Lights	6-8	3	S.C.	63
Dome and Corner Lights	6-8	6	S.C.	81

APPARATUS BOX:—Delco-Remy, Model 480-Z. Mounted on rear of dash under cowl. Consists of current limit relay (vibrating and lock-out circuit breaker), generator cut-out relay, horn relay, and a 10 ampere capacity fuse (in circuit to backing and stop lights).

Current Limit Relay:—Vibrating circuit breaker begins to operate with current load of 35-40 amperes limiting current to 5-20 amperes maximum with direct short-circuit. Lock-out circuit breaker begins to operate with current load of 25-30 amperes limiting current to less than 1 ampere with direct short-circuit. Circuit breaker contact gap limits, .012-.030 inch. Air gap limits, .015-.025 inch (contacts closed). Spring tension 5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

Cut-out Relay:—Contacts close at 7-9 M.P.H. or 520 R.P.M. (generator) with a generator voltage of 6.75-7.5 volts and open with a discharge current of 0-2 amperes. Contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

Horn Relay:—Model 266-T. Pressing horn button energizes horn relay winding, closing horn relay contacts and completing horn circuit. Horn current does not pass through horn button. Horn relay requires .25 amperes to close contacts. Horn relay contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

FUSES:—Backing and stop light fuse mounted in Apparatus Box, 10 ampere capacity.

HORNS:—Klaxon vibrator type matched set with blended note. Model K-22-C Type 1160 (low note), and Model K-22-C Type 1161 (high note). Horns should draw 6.0-8.0 amperes at 6 volts.

CHEVROLET

STANDARD SIX SERIES CC (1933)

MASTER SIX (EAGLE) SERIES CB (1933), SERIAL NUMBERS CB-1001 UP
DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On right hand body sill at right front seat.

ENGINE NUMBER:—Stamped on pad on right hand side of crankcase at fuel pump. First serial number for Master Six, 3,367,317.

ENGINE:—Standard Six. Six cylinder, overhead valve type, 3 5/16x3 1/2" bore and stroke, 181 cubic inch displacement, rated at 26.3 H.P., develops 60 H.P. at 3000 R.P.M. Standard compression ratio 5.2-1.

Master Six. Six cylinder, overhead valve type, 3 5/16x4" bore and stroke, 206.8 cubic inch displacement, rated at 26.3 H.P., develops 65 H.P. at 2800 R.P.M. Standard compression ratio 5.2-1. No optional compression ratio is offered. Both engines fitted with special 'Octane Selector' for timing to permit special adjustment for individual fuel characteristics (see Timing).

BATTERY:—Delco, Type 13-N-CU (passenger cars), 13-NF (export), 6 volt, 13 plate, 86 ampere hour capacity (20 hour rate). Starting capacity 102 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—In cradle on right hand frame side rail under front floor.

Dimensions:—Width, 7 1/16". Length, 9 11/16". Height, 8 11/16".

IGNITION:—Coil Model 536-W. Coil mounted on engine side of dash and connected to ignition switch by means of armored cable (primary lead).

Ignition Current:—1.9 amperes at 6 volts (engine running), 4 amperes at 6 volts (engine stopped).

Ignition Switch:—Delco-Remy Electrolock, Model 428-A (switch and cable) assembled as unit with coil (by armored cable connecting coil and switch).

Distributor Model 622-L (Standard), 644-D (Master). Single breaker, 6 lobe cam, full automatic advance type with supplementary Vacuum Spark Control and 'Octane Selector'.

Breaker Gap:—Set at .018". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Vacuum Spark Control:—Model 680-F. Consists of a spring-loaded vacuum operated diaphragm mounted on Octane Selector bracket and linked to distributor advance plate. It is designed to advance spark up to 12° (engine) at idling speeds. It is entirely automatic and requires no service attention.

Automatic Advance—Model 622-L

Engine	Degrees	Distributor	Distributor	Engine
2	Start	300	600	
32	16	1350	2700	

Automatic Advance—Model 644-D

Engine	Degrees	Distributor	Distributor	Engine
2	Start	275	550	
28.5	14.25	1200	2400	
38.5	19.25	1400	2800	

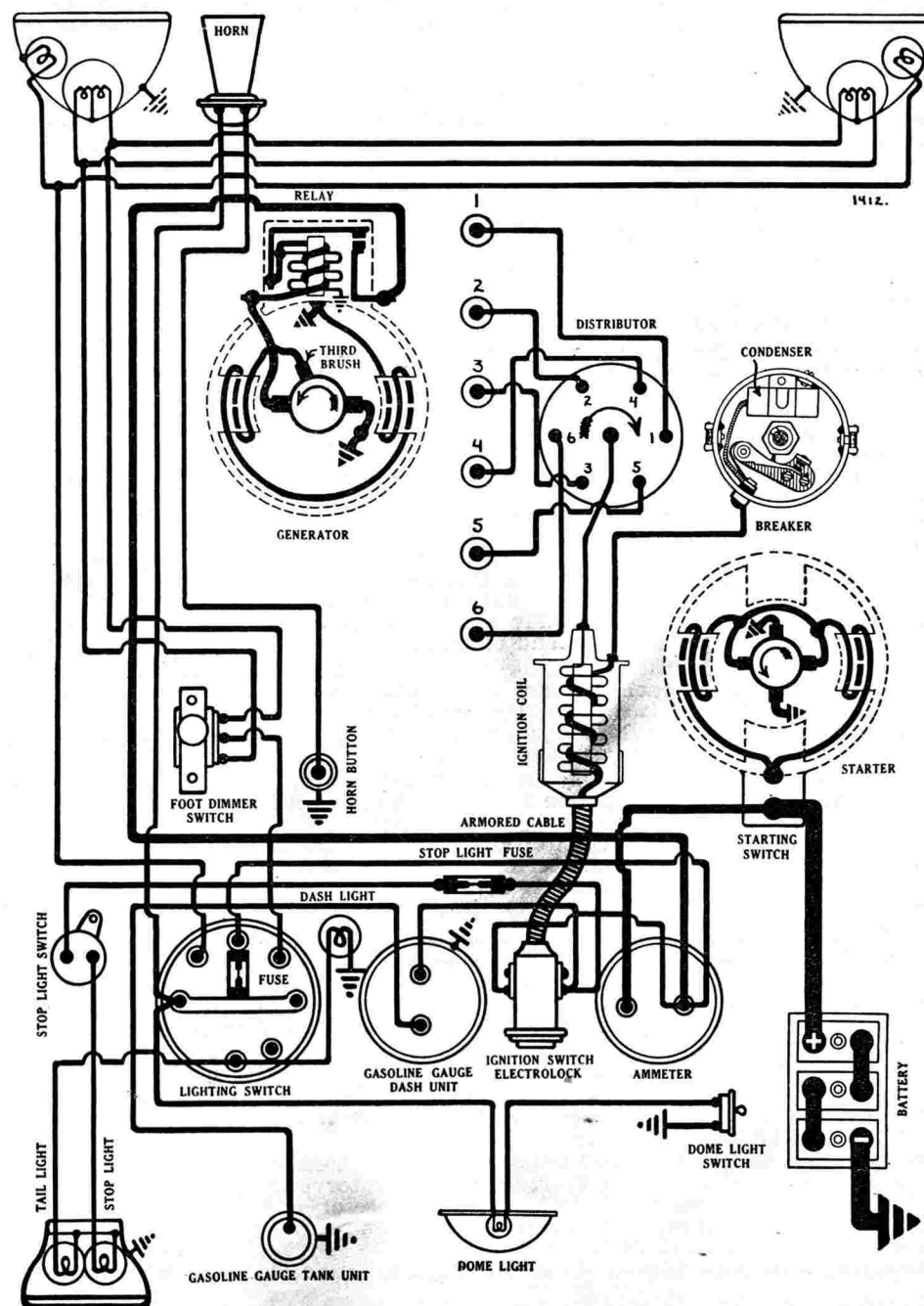
Mounting:—Distributor mounted at right center of crankcase and driven from the camshaft. To remove, disconnect primary lead, take off distributor cap, loosen clamp bolt in advance plate, lift distributor out.

Oiling:—500 Miles. Turn down grease cup on side of shaft housing one full turn. Keep cup filled with No. 2 1/2 cup grease.

1000 Miles. Take off distributor cap and rotor, fill wick oiler in center of shaft with light engine oil, put one drop oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting for both models 10° (flywheel) or .0337" (Standard Six), .0385" (Master Six) piston travel before top dead center with Octane Selector set at zero on scale.

To Set Ignition Timing. First set Octane Selector at zero on scale by turning knurled adjusting nuts. See that Vacuum Spark Control is in retarded position with distributor rotated clockwise to limit of advance linkage movement. With No. 1 piston on compression, turn engine over by hand



CHEVROLET

STANDARD SIX SERIES CC (1933)

MASTER SIX (EAGLE) SERIES CB (1933), SERIAL NUMBERS CB-1001 UP

DELCO-REMY SYSTEM

under pointer in inspection hole in left hand front face of flywheel housing. Then loosen advance plate clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.

These cars are serviced with the regular 1932 flywheel which is marked for ignition by a '12' mark located 12° before top dead center. On cars with this flywheel the ignition should be set in the usual manner with the '12' mark at the indicator.

Octane Selector Setting. After setting ignition as above, Octane Selector should be adjusted for minimum knock (maximum advance setting without spark knock). Octane Selector scale is graduated in 2-degree units for a total of 10 degrees advance and retard from the standard ignition setting as above (ignition should always be set with Octane Selector set at zero of scale). The standard setting is for fuel of approximately 60 octane rating and spark should be advanced for premium or anti-knock fuel and retarded for fuels which do not come up to this rating.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—14 MM. Metric. A.C. Type K-9. Set gaps at .032 inch.

VALVE TIMING:—Camshaft Setting. Valves located in cylinder head are operated by rocker arms on head and pushrods from camshaft at right of engine. Tappet adjustment on rocker arm directly above pushrod. Camshaft is gear driven from the crankshaft. Camshaft gear (fabric) is marked in space between teeth. Crankshaft gear (steel) has one marked tooth. Mesh gears so that marked tooth meshes with marked space.

When new or unmarked gears are installed they should be marked as follows: The mark on the camshaft gear should be after the eleventh tooth counted clockwise from the tooth in line with the keyway on the gear (that is, start count with tooth in line with keyway, count off eleven teeth (Standard) or fifteen teeth (Master) clockwise around the gear and punch mark the next following space. On the crankshaft gear the keyway is directly opposite the space between two teeth. The mark should be on the fourth tooth (Standard) or fifth tooth (Master) counter-clockwise from this space (begin count with tooth to left of space in line with keyway and punch mark the fourth (Standard) or fifth (Master) tooth counter-clockwise around the gear).

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 29/64"	5/16"	4 15/16"	45°	.314"
Exhaust	1 11/32"	5/16"	4 15/16"	45°	.314"

Tappet Clearance

	Intake	Exhaust
Hot	.006"	.008"
Cold	Closed	Open
Weight	57 pounds	95 pounds

Valve Springs

NOTE:—Valve springs are painted yellow to distinguish them from previous designs. They are not interchangeable with 1932 valve springs.

Intake Valves

Timing

Exhaust Valves

Open—4° before top dead center	Open—47° before lower dead center
Close—34° after lower dead center	Close—4° after top dead center

CARBURETION:—Carter Downdraft Carburetor, Model W1, Type 260-S (Standard Six), 259-S (Master Six). See Carburetor Section for complete data. Manifold heat control is automatically operated by thermostatic spring (Master Six) and can be manually adjusted at manifold (Standard Six).

Air Cleaner:—Oil-wetted wire mesh type. Remove at 2500 mile intervals or oftener, take off felt silencer pad on top of unit, clean wire mesh by dipping in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil.

Fuel Pump:—A.C. Mechanical Fuel Pump mounted on right side of crankcase and driven from the camshaft (see Equipment Section for complete data).

Gasoline Gauge:—A.C. Electric type (see Equipment Section for complete

mounted on starter field frame operated by foot pedal (Standard Six) or special 'Starterator' connected to accelerator pedal (Master Six). See Equipment Section for complete data on Starterator. Starter rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter draws 90 amperes at 5.75 volts while cranking engine with armature speed of 1900 R.P.M.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5.0	65
12 "	Lock	3.63	475

Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage, take out flange mounting cap screws, pull starter forward to clear Bendix, lift out.

Oiling:—500 Miles. Put 2-3 drops light engine oil in oiler on commutator end. **GENERATOR:**—Model 943-J. Third brush regulation. Rotation counter-clockwise at commutator end. With standard setting maximum charging rate is 17 amperes (cold) at 8.2 volts reached at 1700 R.P.M. or 19 M.P.H.

Charging Rate Adjustment. Take off commutator cover band, loosen lock screw on outside of end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten lock screw.

Cold Test		Generator Data		Hot Test	
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
16-18	8.2	1700	11-13	7.5-7.8	1750-1850

Brush Spring Tension:—14-18 ounces on each brush.

Field Current:—3.5-4.5 amperes at 6 volts across field terminals.

Motoring:—Approximately 5 amperes at 6 volts.

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine and slip off drive belt, take out two bolts forming bracket hinge, lift generator out.

Belt Adjustment:—Loosen adjustment clamp bolt and mounting bolts, pull generator away from engine until generator pulley can just be turned by hand, tighten adjustment clamp bolt before slacking off on generator, tighten mounting bolts.

Oiling:—500 Miles. Put 4-5 drops light engine oil in oiler at each end.

RELAY:—Model 265-H. Mounted on generator field frame. Contacts close at 660 R.P.M. with generator voltage of 7.2 volts at approximately 6 M.P.H. and open with 1 ampere discharge current (limits 0-2.5 amperes).

Contact Gap:—.015-.025". **Air Gap:**—.012-.017" (contacts closed).

LIGHTING:—Delco-Remy Switch, Model 478-H. Dimmer Switch Model 465-Z. Lighting switch mounted on back of instrument board and controlled by button at lower left hand corner of instrument panel. Lighting system uses 'depressed beam' dimming with double filament bulbs controlled by foot operated dimmer switch on toeboard. Stop light switch Model 474-Z (Standard), 474-L, Y (Master).

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs	6-8	3	S.C.	63
Cowl Lights (Special)	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	3	S.C.	63
Dome Light	6-8	3	S.C.	63

FUSES:—15 ampere capacity fuse mounted on back of lighting switch. A 15 ampere capacity fuse is connected in the stop lamp lead. Fuse is mounted in a metal cartridge located under the cowl.

HORNS:—Klaxon Model K-31. Type 1355. Vibrator horn mounted under right headlight. Current draw 4.0-6.5 amperes at 6 volts. Model K-31. Type 1356

CHRYSLER

**SIX CYLINDER MODEL CO (1933), SERIAL NUMBERS 6,576,001 UP
DELCO-REMY SYSTEM**

CAR SERIAL NUMBER:—On right front door hinge pillar post .

ENGINE NUMBER:—Stamped on boss on left hand side of cylinder block between No. 1 and No. 2 cylinders.

ENGINE:—Six cylinder, 'L' head type, 3¼x4½" bore and stroke, 223.98 cubic inch displacement, rated at 25.35 H.P., develops 83 H.P. at 3400 R.P.M. (standard compression Silver Dome head engine), or 89 H.P. at 3400 R.P.M. (optional high compression Red Head engine). Standard compression ratio (Silver Dome head), 5.35-1. Optional high compression ratio (Red Heads), 6.2-1. Special spark plugs and ignition setting used for Red Head engines (see Timing).

BATTERY:—Willard, Type WS-2-15, 6 volt, 15 plate, 100 ampere hour capacity (20 hour rate). Starting capacity 122 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded on left hand rear corner of transmission.

Mounting:—In cradle on left hand side of frame under driver's seat.

Dimensions:—Width, 7 1/16". Length, 10 5/16". Height, 8 13/16"

IGNITION:—Coil Model 537-U. Mounted on dash and connected to ignition switch through armored cable (primary lead).

Ignition Current:—5-1.5 amperes at 6 volts (engine running), 4-5 amperes at 6 volts (engine stopped).

Ignition Switch:—Unit with coil. Switch mounted on instrument panel and connected to coil by armored cable. Gasoline gauge and starter control solenoid circuit connected to ignition switch and operative only with switch turned 'on'.

Distributor Model 622-C (first cars), 644-L (later cars). Single breaker, 6 lobe cam, full automatic advance type. Condenser mounted on breaker plate. Contacts are adjusted by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw.

Breaker Gap:—Set at .020". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—19-23 ounces measured at point directly behind contacts with spring scale at right angles to back of breaker arm.

Automatic Advance—Model 622-C

Engine	Degrees	Distributor	Distributor	R.P.M.	Engine
0		Start	400		800
16		8	1300		2600
Automatic Advance—Model 644-L					
2		Start	250		500
15.2		7.6	420		840
26		13	1100		2200

Mounting:—Distributor mounted at left center of crankcase and driven by inclined shaft from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance arm, lift out.

Oiling:—500 Miles. Turn down grease cup on side of shaft housing one full turn. Keep cup filled with medium cup grease.

2000 Miles. Take off distributor cap and rotor. Put 4-5 drops light engine oil in wick oiler in center of shaft, oil breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

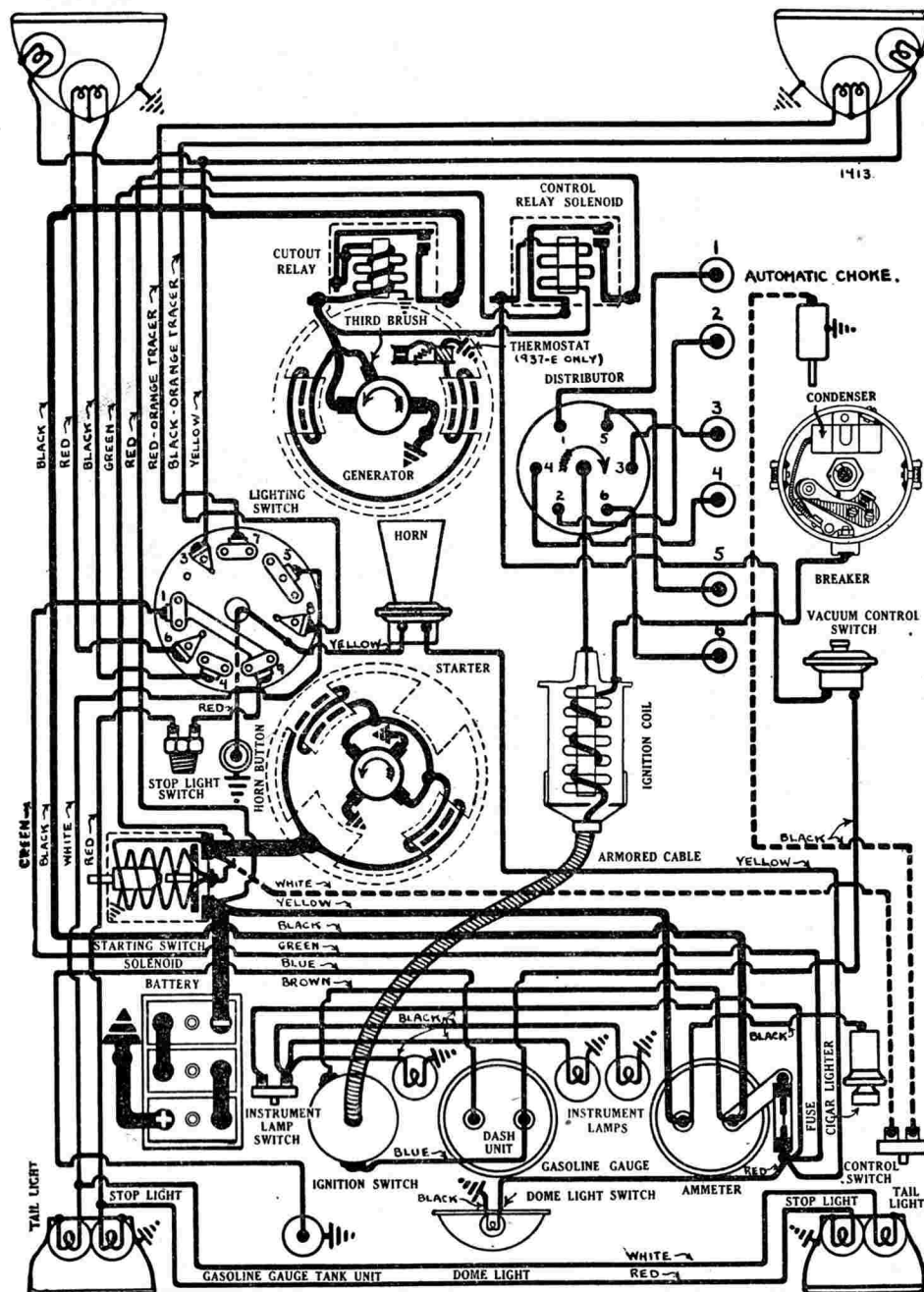
IGNITION TIMING:—Standard settings for all engines as follows:

Engine Type	Distributor Type	Flywheel Degrees	Piston Travel
Silver Dome Head.....	622-C.....	10° before TDC.....	.043"
Silver Dome Head.....	644-L.....	At top dead center.....	TDC.
Red Head Engine.....	622-C.....	8° before TDC.....	.027"
Red Head Engine.....	644-L.....	5° after TDC.....	.011"

To Set Ignition Timing. First remove cover plate over inspection hole in left front face of flywheel housing below starter. With No. 1 piston on compression stroke turn engine over until flywheel mark 'D C' is directly opposite ignition pointer (where setting is before top dead center this will be above the dead center pointer) or opposite the dead center pointer when setting is at top dead center. Then loosen clamp bolt in advance plate, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—14 MM. Metric. A.C. Type K-12 (standard compression Silver



CHRYSLER

SIX CYLINDER MODEL CO (1933), SERIAL NUMBERS 6,576,001 UP
DELCO-REMY SYSTEM

Dome engines), Type K-10 (high compression Red Head engines). Set spark plug gaps at .025 inch.

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is driven by two-sprocket non-adjustable chain drive from the crankshaft. Sprockets are marked. To set timing, turn crankshaft so that pistons Nos. 1 and 6 are on top dead center with flywheel mark 'D/C' at indicator. Mesh sprockets in chain so that marks on sprockets are adjacent and in line with a straightedge laid across the shaft centers. Camshaft mounting cap screws are offset so that camshaft sprocket can only be mounted in correct position.

To Check Valve Timing. Take out $\frac{1}{8}$ inch pipe plug in cylinder head directly over No. 6 cylinder and install regular Chrysler Timing Gauge. With No. 1 piston on top dead center entering power stroke, set tappet clearance of No. 1 cylinder valves at .011" (intake), .012" (exhaust). Turn engine over one complete revolution and stop when gauge indicates piston is .013" past top dead center. No. 1 intake valve should open at this point. Turn engine over 2° more and stop when gauge reading is .030". No. 1 exhaust valve should close at this point. Reset tappet clearance at .005" (intake), .007" (exhaust) with engine warm.

Valve Specifications

	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 17/32" (1 3/8" clear)	11/32"	45°	5/16"
Exhaust	1 15/32" (1 5/16" clear)	11/32"	45°	5/16"

Tappet Clearance

	Operating Timing	
Intake	.005" (hot) .011" (cold)	Closed—40-44 pounds—2 1/16"
Exhaust	.007" (hot) .012" (cold)	Compression Limit—1 3/4"

Intake Valves

	Timing	
Open	6° after top dead center	Open—42° before lower dead center
Close	46° after lower dead center	Close—8° after top dead center

Valve Grinding:—Valve material chrome nickel steel (intake valves), sil-chrome steel (exhaust valves). Special alloy exhaust valve seat inserts are used in the cylinder block. Valves should be refaced on valve grinder and then lapped in block. Ordinary reseating tool cannot be used on exhaust valve inserts and these must be ground when necessary. Install valves with .001-.003" stem clearance in guides (intake valves), .003-.005" (exhaust valves). Valve stem guides are removable.

CARBURETION:—Stromberg Downdraft Carburetor, Model EX-32 (see Carburetor Section for complete data). Manifold heat control is automatic. Choke is controlled manually by button on dash (Sisson Automatic Choke is optional—see Carburetor Section).

Air Cleaner:—Oil-wetted wire mesh type integral with silencer. Remove complete unit from engine at 2000 mile intervals or oftener, clean by dipping wire mesh end of unit in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical type mounted at right of engine and driven by an eccentric on the camshaft. Remove glass sediment bowl at three-month intervals, empty water and sediment, clean filter screen, located directly above bowl, before reassembling.

Gasoline Gauge:—Motometer electric type (see Equipment Section).

STARTER:—Model 734-L, R, Model 727-B (R.H.D.). Starter drive, overrunning clutch and mechanical pinion shift operated by solenoid mounted on starter field frame. Solenoid controlled automatically by vacuum switch connected to throttle linkage and relay solenoid in cut-out relay case on generator (see 'Starter Controls' in Equipment Section for complete data on this equipment). Starter rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces on each brush.

Starter Data—Model 734-L, R

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5.0	65
12 "	Lock	3.63	475

Starter Data—Model 727-B

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5500	5.0	65
15 "	Lock	3.0	600

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect all wires on solenoid, take out flange mounting cap

screws, pull starter forward to clear pinion housing, lift out.

Oiling:—6000 Miles. Put 8-10 drops light engine oil in commutator end oiler and oil connections of pinion shifting linkage.

GENERATOR:—Model 943-S (first cars), 937-D (later cars), 937-E (cars with radio). Third brush regulation, thermostat control (937-E only). Thermostat contacts open at 175°F. reducing the charging rate approximately 40%. Rotation counter-clockwise at commutator end. Manufacturer recommends that charging rate be set at 8 amperes (943-S, 937-D), 10 amperes (937-E) maximum charge to battery as indicated on dash ammeter with all lights on and engine operating at speed equivalent to 20 M.P.H.

Charging Rate Adjustment. Loosen small round lock screw on commutator end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data—Models 943-S, 937-D

	Standard Setting			Maximum Output	
	Amperes	Volts	R.P.M.	Amperes	Volts
Cold	16-17	7.9-8.1	2000	19-21	8.1-8.3
Hot	13-15	7.7-8.0	2400	13-15	7.7-8.0

Generator Data—Model 937-E

Cold	20-22	8.2-8.4	2100	Cold	22-24
Hot	12-14	7.7-8.0	2800-3000	Hot	12-14

Brush Spring Tension:—24-28 ounces on each brush.

Field Current:—3.5-4.5 amperes at 6 volts across field terminals.

Field Fuse:—6 ampere capacity (943-S after Serial No. 30,000; 937-D after Serial No. 12,000).

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out two bolts forming bracket hinge, lift generator out.

Belt Adjustment:—Attach spring scale to generator by wire looped over field frame so that force of spring is tangent to top of generator and parallel to slot in adjustment clamp arm. Loosen adjustment clamp bolt, pull generator away from engine until scale reading is 45-50 pounds, tighten clamp bolt before slacking off on scale.

Oiling:—2000 Miles. Put 8-10 drops light engine oil in oiler at each end.

RELAY:—Mounted on generator field frame. Consists of cut-out relay and special relay solenoid for control of starter operating solenoid. See article in Equipment Section for complete data on relay solenoid. Cut-out relay contacts close when generator voltage reaches 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025". **Air Gap:**—.012-.017" with contacts closed.

Relay Solenoid:—Contacts close at 4.3-4.7 volts and will remain closed until battery voltage drops to 2.0 volts or less (when starter is cranking engine). Contacts open when difference in voltage between generator and battery is 2.0 volts or less. Contact gap limits .050-.055 inch. Air gap limits .007-.009 inch with contacts closed.

LIGHTING:—Clum Switch, Model 9454. Lighting switch mounted at lower end of steering column is controlled by lever on steering wheel. Lighting system uses standard double filament bulbs but switch has special 'passing' position with depressed beam (upper filament) of left hand headlight and driving beam (lower filament) of right hand headlight lighted (see wiring diagram).

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21	D.C.	1116
Parking Bulbs	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Lights	6-8	15	S.C.	87
Dome Lights	6-8	15	S.C.	87

FUSES:—20 ampere capacity fuse mounted on back of instrument board near ammeter.

HORNS:—Klaxon Model K-31, Type 1364 Vibrator Horn standard equipment. Current draw 4.0-6.5 amperes at 6 volts. Model K-26, Type 1505 (low note), 1506 (high note) matched tone, twin horns are optional. Current draw 6.0-8.5 amperes at 6 volts (Type 1505). 5.0-6.5 amperes at 6 volts (Type 1506).

CHRYSLER

ROYAL EIGHT MODEL CT (1933), SERIAL NUMBERS 7,000,001 UP DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On right front door hinge pillar post.

ENGINE NUMBER:—Stamped on boss on left hand side of cylinder block between No. 1 and No. 2 cylinders.

ENGINE:—Eight cylinder, 'L' head type, $3\frac{1}{4} \times 4\frac{1}{8}$ " bore and stroke, 273.8 cubic inch displacement, rated at 33.80 H.P., develops 90 H.P. at 3400 R.P.M. (standard compression Silver Dome head engine), or 98 H.P. at 3400 R.P.M. (optional high compression Red Head engine). Standard compression ratio (Silver Dome engines), 5.2-1. Optional high compression ratio (Red Head engines), 6.2-1. Special ignition setting and spark plugs are used for high compression engines (see Timing).

BATTERY:—Willard, Type WH-2-15, 6 volt, 15 plate, 119 ampere hour capacity (20 hour rate). Starting capacity 140 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to transmission cover.

Mounting:—In cradle on left hand side of frame under driver's seat.

Dimensions:—Width, 7 $\frac{1}{16}$ ". Length, 10 $\frac{5}{16}$ ". Height, 9 $\frac{5}{16}$ ".

IGNITION:—Coil Model 537-L, K. Coil mounted on dash and connected to ignition switch through armored cable (primary lead).

Ignition Current:—5-1.5 amperes at 6 volts (engine running), 4-5 amperes at 6 volts (engine stopped).

Ignition Switch:—On instrument panel connected to coil by armored cable. Gasoline gauge and starter control solenoid circuit connected to switch and operative only with switch turned 'on'.

Distributor Model 661-R (all cars). Single breaker, 8 lobe cam, full automatic advance type. No synchronization of contacts is necessary. Contact gap adjusted by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw.

Breaker Gap:—Set contact gap at .018". Hold within limits of .017-.022".

Breaker Arm Spring Tension:—19-23 ounces measured at point directly behind contacts with spring scale at right angles to back of breaker arm.

Degrees	Automatic Advance		R.P.M.
Engine	Distributor	Distributor	Engine
2	Start	250	500
15.2	7.6	420	840
28	14	1200	2400

Mounting:—Distributor mounted at left center of crankcase and driven by inclined shaft from camshaft. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance plate, lift distributor out.

Oiling:—500 Miles. Turn down grease cup on side of shaft housing one full turn. Keep cup filled with medium cup grease.

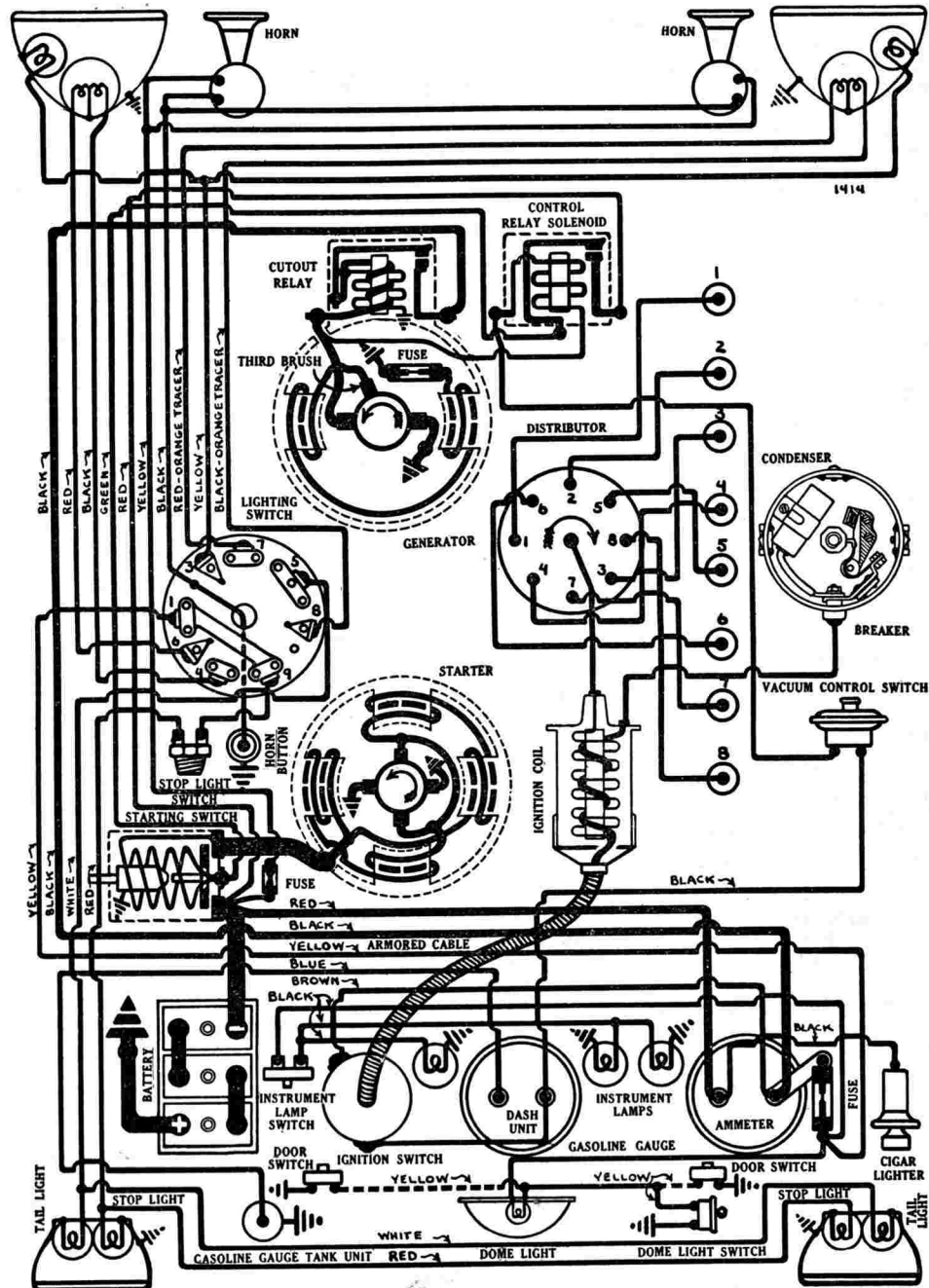
2000 Miles. Take off distributor cap and rotor, put 4-5 drops light engine oil in wick oiler in center of shaft, oil breaker arm pivot pins, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard Setting Silver Dome Engines—2° (flywheel) or .001" (piston travel) before top dead center. Red Head Engines—top dead center.

To Set Ignition Timing. First take off cover plate over inspection hole in left hand front face of flywheel housing below starter. With No. 1 piston on compression stroke, turn engine over until flywheel mark 'D/C' is directly opposite ignition pointer in inspection hole with piston .001" before top dead center (Silver Dome engines) or at top dead center (Red Head engines). Then loosen clamp bolt on advance plate, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—14 MM. Metric. A.C. Type K-12 (Standard Silver Dome engines), Type K-10 (Red Head engines). Set spark plug gaps at .025 inch.



CHRYSLER

ROYAL EIGHT MODEL CT (1933), SERIAL NUMBERS 7,000,001 UP

DELCO-REMY SYSTEM

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is driven by two-sprocket non-adjustable chain drive from the crankshaft. To set timing, with crankshaft turned so that pistons Nos. 1 and 8 are on top dead center with flywheel mark 'D/C' at indicator in inspection hole, mesh chain so that marks on sprockets are adjacent and in line with strightedge laid across shaft centers. Camshaft sprocket bolt holes offset.

To Check Valve Timing. Take out 1/8 inch pipe plug in cylinder head directly over No. 8 piston and install regular Chrysler Timing Gauge. With No. 1 piston on top dead center entering power stroke, set tappet clearance of No. 1 cylinder valves at .011" (intake), .012" (exhaust). Turn engine over one complete revolution and stop with piston slightly past top dead center (6°) when gauge reads .013". No. 1 intake valve should open at this point. Turn engine over 2° and stop when gauge reading is .024". No. 1 exhaust valve should close at this point. Reset tappet clearance at .005" (intake), .007" (exhaust) with engine warm.

Valve Specifications

	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 15/32" (1 5/16" clear)	11/32"	45°	5/16"
Exhaust	1 13/32" (1 1/4" clear)	11/32"	45°	5/16"

Tappet Clearance

	Operating	Timing
Intake	.005" (hot)	.011" (cold)
Exhaust	.007" (hot)	.012" (cold)

Valve Springs

	Closed	Open
Intake	40-44 pounds	2 1/16"
Exhaust	40-44 pounds	2 1/16"

Intake Valves

	Timing
Open	6° after top dead center
Close	46° after lower dead center

Exhaust Valves

	Timing
Open	42° before lower dead center
Close	8° after top dead center

Valve Grinding:—Valves should be refaced on valve grinder and then lapped in block. Special alloy exhaust valve seat inserts are used. These must be ground when necessary as ordinary reseating tools cannot be used. Install valves with .001-.003" stem clearance in guides (intake valves), .004" (exhaust valves). Valve stem guides are removable.

CARBURETION:—Stromberg Downdraft Carburetor, Model EX-32 (see Carburetor Section for complete data). Manifold heat control is automatic. Choke is controlled manually by button on dash.

Air Cleaner:—Oil-wetted wire mesh type integral with silencer. Remove complete unit from engine at 2000 mile intervals or oftener, clean by dipping wire mesh end of unit in pan of gasoline, dry thoroughly, re-oil by dipping in pan of heavy engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical Fuel Pump mounted on right side of crankcase and driven by eccentric on camshaft (see Equipment Section for complete data). Remove glass sediment bowl at three-month intervals, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—Motometer electric type (see Equipment Section).

STARTER:—Model 725-Z, 727-B (R.H.D.). Starter drive, overrunning clutch and mechanical pinion shift operated by solenoid mounted on starter field frame. Solenoid is controlled automatically by vacuum switch connected to throttle linkage and relay solenoid in cut-out relay case on generator (see 'Starter Controls' in Equipment Section for complete data on this equipment). Starter rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5500	5.0	60
15 "	Lock	3.0	600

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect all wires on solenoid, take out flange mounting screws, pull starter straight forward to clear pinion housing, lift out.

Oiling:—5000 Miles. Put 8-10 drops light engine oil in oiler on commutator end. Drive end bearing at outer end of pinion housing is oilless.

GENERATOR:—Model 937-D (Standard), 937-F (cars with radio). Third brush regulation, thermostat control (937-F only). Thermostat contacts open at 175°F. reducing charging rate approximately 40%. Rotation counter-clockwise at commutator end. Manufacturer recommends that charging rate be set at 8 amperes (937-D) or 10 amperes (937-F) maximum charge to battery as shown on dash ammeter with all lights on and engine operated at speed equivalent to 20 M.P.H.

Charging Rate Adjustment. Loosen small round lock screw on commutator end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data—Model 937-D

Standard Setting				Maximum Output			
	Amperes	Volts	R.P.M.		Amperes	Volts	R.P.M.
Cold	16-17	7.9-8.1	2000	Cold	19-21	8.1-8.3	2300
Hot	13-15	7.7-8.0	2400	Hot	13-15	7.7-8.0	2400

Generator Data—Model 937-F

Cold	20-22	8.2-8.4	2100	Cold	22-24	8.4-8.6	2400
Hot	12-14	7.7-8.0	2800-3000	Hot	12-14	7.7-8.0	2800-3000

Brush Spring Tension:—24-28 ounces on each brush.

Field Current:—3.4-4.5 amperes at 6 volts across field terminals.

Field Fuse:—6 ampere capacity (after Serial No. 12000).

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out two bolts forming bracket hinge, lift generator out.

Belt Adjustment:—Attach spring scale to generator by wire looped over field frame so that force of spring is tangent to top of generator and parallel to slot in adjustment clamp arm. Loosen adjustment clamp bolt, pull generator away from engine until scale reading is 45-50 pounds, tighten clamp bolt before slacking off on scale.

Oiling:—2000 Miles. Put 8-10 drops light engine oil in oiler at each end.

RELAY:—Mounted on generator field frame. Consists of cut-out relay and special relay solenoid for control of starter operating solenoid. See article in Equipment Section for complete data on relay solenoid. Cut-out relay contacts close when generator voltage reaches 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025". **Air Gap:—**.012-.017" with contacts closed.

Relay Solenoid:—Contacts close at 4.3-4.7 volts and will remain closed until battery voltage drops to 2.0 volts or less (when starter is cranking engine). Contacts open when difference in voltage between generator and battery is 2.0 volts or less. Contact gap limits .050-.055 inch. Air gap limits .007-.009 inch with contacts closed.

LIGHTING:—Clum Switch, Model 9454. Lighting switch mounted at lower end of steering column is controlled by lever on steering wheel. Lighting system uses standard double filament bulbs but switch has special 'passing' position with depressed beam (upper filament) of left hand headlight and driving beam (lower filament) of right hand headlight lighted (see wiring diagram).

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21	D.C.	1116
Parking Bulbs	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Lights	6-8	15	S.C.	87
Dome Lights	6-8	15	S.C.	87

FUSES:—20 ampere capacity fuse mounted on back of instrument board near ammeter. A second 20 ampere fuse is assembled in a connector in the horn cable (see wiring diagram).

HORNS:—Klaxon, Model K-26, Type 1505 (low note), 1506 (high note), matched tone twin horns are standard. Current draw 6.0-8.5 amperes at 6 volts (Type 1505), 5.0-6.5 amperes at 6 volts (Type 1506).

CHRYSLER

IMPERIAL EIGHT MODEL CQ (1933), SERIAL NUMBERS 7,529,001 UP
DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On right hand front door hinge pillar post.

ENGINE NUMBER:—Stamped on boss on left hand side of cylinder block between No. 1 and No. 2 cylinders.

ENGINE:—Eight cylinder, 'L' head type, $3\frac{1}{4} \times 4\frac{1}{2}$ " bore and stroke, 298.6 cubic inch displacement, rated at 33.80 H.P., develops 108 H.P. at 3400 R.P.M. (Standard Red Head Engine), or 100 H.P. at 3400 R.P.M. (optional Silver Dome head engine). Standard compression ratio (Red Head engine), 6.2-1. Optional low compression ratio (Silver Dome head engine), 5.2-1. Special spark plugs and ignition settings are used for each engine (see Timing).

BATTERY:—Willard, Type WS-4-17, 6 volt, 17 plate, 115 ampere hour capacity (20 hour rate). Starting capacity 140 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to transmission.

Mounting:—In cradle on left hand side of frame under driver's seat.

Dimensions:—Width, 7 $\frac{1}{16}$ ". Length, 11 $\frac{11}{16}$ ". Height, 8 $\frac{13}{16}$ ".

IGNITION:—Coil Model 537-U, M. Coil mounted on dash and connected to switch by armored cable.

Ignition Current:—5-1.5 amperes at 6 volts (engine running), 4-5 amperes at 6 volts (engine stopped).

Ignition Switch:—Unit with coil. Gasoline gauge and starter solenoid control circuit connected to switch and operative only with ignition turned 'on'.

Distributor Model 661-G (first cars), 661-T (later cars). Single breaker, 8 lobe cam, full automatic advance type. No synchronization of contacts is necessary. Contact gap adjusted by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw.

Breaker Gap:—Set contact gap at .018". Hold within limits of .017-.022".

Breaker Arm Spring Tension:—19-23 ounces measured at point directly behind contacts with spring scale at right angles to back of breaker arm.

Automatic Advance—Model 661-G

Engine	Degrees	Distributor	Distributor	R.P.M.	Engine
2.....	Start	400.....	800		
14.....	7	1300.....	2600		

Automatic Advance—Model 661-T

4.....	Start	250.....	500
14.....	7	400.....	800
26.....	13	1300.....	2600

Mounting:—Distributor mounted at left center of crankcase and driven by inclined shaft from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance plate, lift distributor out.

Oiling:—500 Miles. Turn down grease cup on side of shaft housing one full turn. Keep cup filled with medium cup grease.

2000 Miles. Take off distributor cap and rotor, put 4-5 drops light engine oil in wick oiler in center of shaft, oil breaker arm pivot pins, apply thin film of vaseline to face of breaker cam.

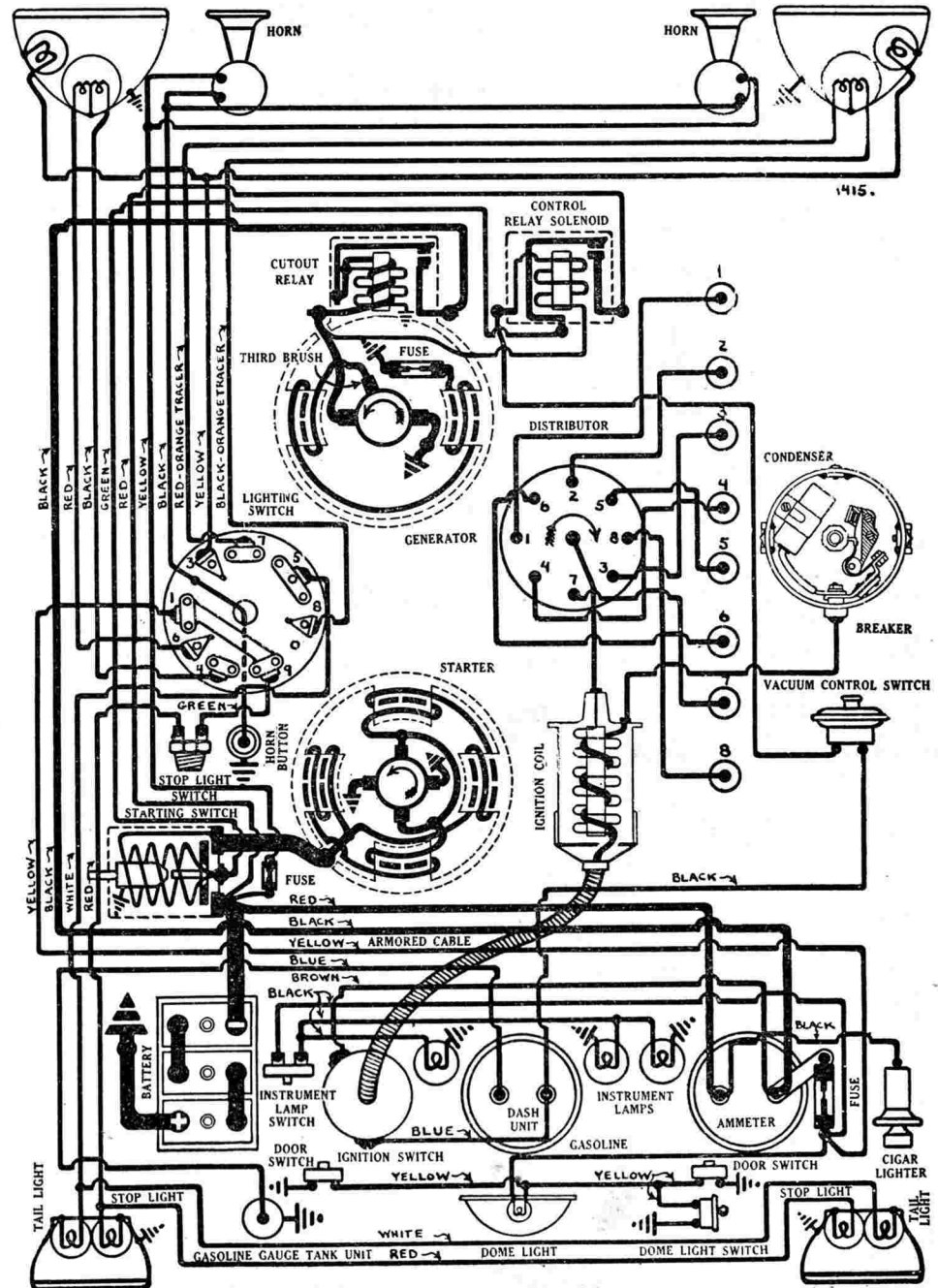
IGNITION TIMING:—Special ignition settings are used for both Silver Dome and Red Head engines equipped with each type distributor as indicated in following table:

Engine Type	Distributor	Ignition Setting
Red Head Engine.....	661-G.....	.021" (piston) before top dead center
Silver Dome Engine.....	661-G.....	.043" (piston) before top dead center
Red Head Engine.....	661-T.....	.002" (piston) after top dead center
Silver Dome Engine.....	661-T.....	At top dead center.

To Set Ignition Timing:—First take off cover plate over inspection hole in left hand front face of flywheel housing below starter. With piston No. 1 on compression stroke, turn engine over by hand until flywheel mark 'D/C' is directly opposite ignition pointer in inspection hole (see above table—pointers are marked, no ignition pointer is provided where setting is on top dead center and dead center pointer should be used). Then loosen clamp bolt in advance plate, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—14 MM. Metric. A.C. Type K-10 (Standard Red Head engine), Type K-12 (optional Silver Dome head engine). Set spark plug gaps at .025".



CHRYSLER

IMPERIAL EIGHT MODEL CQ (1933), SERIAL NUMBERS 7,529,001 UP
DELCO-REMY SYSTEM

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is driven by two-sprocket non-adjustable chain drive from the crankshaft. Sprockets are marked. To set timing, with crankshaft turned so that pistons Nos. 1 and 8 are on top dead center with flywheel mark 'D/C' at indicator, mesh chain so that marks on sprockets are adjacent and in line with a straightedge laid across the shaft centers. Camshaft sprocket mounting holes are offset so that sprocket can only be mounted in correct position.

To Check Valve Timing. Take out 1/8 inch pipe plug in cylinder head directly over No. 8 piston and install regular Chrysler Timing Gauge. With piston No. 1 on top dead center entering power stroke, set tappet clearance of No. 1 cylinder valves at .011" (intake), .012" (exhaust). Turn engine over one complete revolution and stop with piston slightly past top dead center when gauge reading is .015". No. 1 intake valve should open at this point. Turn engine over 2° and stop when gauge reading is .027". No. 1 exhaust valve should close at this point. Reset tappet clearance at .005" (intake), .007" (exhaust) with engine warm.

Valve Specifications

	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 15/32" (1 5/16" clear)	11/32"	45°	5/16"
Exhaust	1 13/32" (1 1/4" clear)	11/32"	45°	5/16"

Tappet Clearance

Valve Springs

Operating Timing		Closed—40-44 pounds—2 1/16"	
Intake	.005" (hot) .011" (cold)	Compression Limit—13/4"	
Exhaust	.007" (hot) .012" (cold)		
Timing		Exhaust Valves	
Open—6° after top dead center		Open—42° before lower dead center	
Close—46° after lower dead center		Close—8° after top dead center	

Valve Grinding:—Valves should be refaced on valve grinder and then lapped in block. Special alloy exhaust valve seat inserts are used. These must be ground when necessary as ordinary reseating tool cannot be used on them. Install valves with .001-.003" stem clearance in guides (intake valves), .003-.005" (exhaust valves). Valve stem guides are removable.

CARBURETION:—Stromberg Carburetor, Model EX-32 (see Carburetor Section for complete data). Manifold heat control is automatic. Choke is controlled manually by button on instrument panel.

Air Cleaner:—Oil-wetter wire mesh type integral with silencer. Remove complete unit at 2000-mile intervals or oftener, clean wire mesh by dipping in pan of gasoline, dry thoroughly, re-oil by dipping in pan of heavy engine oil, drain before reassembling.

Fuel Pump:—A.C. Combination Fuel Pump and Vacuum Pump (windshield wiper booster)—see Equipment Section for complete data. Remove glass sediment bowl under pump at three-month intervals, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—Motometer electric type (see Equipment Section).

STARTER:—Model 725-Z, 727-B (R.H.D.). Starter drive, overrunning clutch and mechanical pinion shift operated by solenoid mounted on starter field frame. Solenoid is controlled automatically by vacuum switch connected to throttle linkage and relay solenoid in cut-out relay case on generator (see 'Starter Controls' in Equipment Section for complete data on this equipment). Starter rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5500	5.0	60
15 "	Lock	3.0	600

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect all wires on solenoid, take out flange mounting screws, pull starter straight forward to clear pinion housing, lift out.

Oiling:—5000 Miles. Put 8-10 drops light engine oil in oiler on commutator end. Drive end bearing at outer end of pinion housing is oilless.

GENERATOR:—Model 937-D (Standard), 937-F (cars with radio). Third brush regulation, thermostat control (937-F only). Thermostat contacts open at 175°F. reducing charging rate approximately 40%. Rotation counter-clockwise at commutator end. Manufacturer recommends that charging rate be set at 8 amperes (937-D) or 10 amperes (937-F) maximum charge to battery as shown on dash ammeter with all lights on and engine operated at speed equivalent to 20 M.P.H.

Charging Rate Adjustment. Loosen small round lock screw on commutator end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data—Model 937-D

Standard Setting		Maximum Output	
Amperes	Volts	Amperes	Volts
Cold .....16-17.....	7.9-8.1.....	2000	19-21.....8.1-8.3.....
Hot .....13-15.....	7.7-8.0.....	2400	Hot .....13-15.....7.7-8.0.....

Generator Data—Model 937-F

Cold .....20-22.....	8.2-8.4.....	2100	Cold .....22-24.....	8.4-8.6.....	2400
Hot .....12-14.....	7.7-8.0.....	2800-3000	Hot .....12-14.....	7.7-8.0.....	2800-3000

Brush Spring Tension:—24-28 ounces on each brush.

Field Current:—3.4-4.5 amperes at 6 volts across field terminals.

Field Fuse:—6 ampere capacity (after Serial No. 12000).

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out two bolts forming bracket hinge, lift generator out.

Belt Adjustment:—Attach spring scale to generator by wire looped over field frame so that force of spring is tangent to top of generator and parallel to slot in adjustment clamp arm. Loosen adjustment clamp bolt, pull generator away from engine until scale reading is 45-50 pounds, tighten clamp bolt before slacking off on scale.

Oiling:—2000 Miles. Put 8-10 drops light engine oil in oiler at each end.

RELAY:—Mounted on generator field frame. Consists of cut-out relay and special relay solenoid for control of starter operating solenoid. See article in Equipment Section for complete data on relay solenoid. Cut-out relay contacts close when generator voltage reaches 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025". **Air Gap:—**.012-.017" with contacts closed.

Relay Solenoid:—Contacts close at 4.3-4.7 volts and will remain closed until battery voltage drops to 2.0 volts or less (when starter is cranking engine). Contacts open when difference in voltage between generator and battery is 2.0 volts or less. Contact gap limits .050-.055 inch. Air gap limits .007-.009 inch with contacts closed.

LIGHTING:—Clum Switch, Model 9454. Lighting switch mounted at lower end of steering column is controlled by lever on steering wheel. Lighting system uses standard double filament bulbs but switch has special 'passing' position with depressed beam (upper filament) of left hand headlight and driving beam (lower filament) of right hand headlight lighted (see wiring diagram).

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21	D.C.	1116
Parking Bulbs	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Lights	6-8	15	S.C.	87
Dome Lights	6-8	15	S.C.	87

FUSES:—20 ampere capacity fuse mounted on back of instrument board near ammeter. A second 20 ampere fuse is assembled in a connector in the horn cable (see wiring diagram).

HORNS:—Klaxon, Model K-26, Type 1505 (low note), 1506 (high note), matched tone twin horns are standard. Current draw 6.0-8.5 amperes at 6 volts (Type 1505), 5.0-6.5 amperes at 6 volts (Type 1506).

CHRYSLER

CUSTOM IMPERIAL EIGHT, MODEL CL* (1933)

DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On right hand front door hinge pillar post.

ENGINE NUMBER:—Stamped on boss on left hand side of cylinder block directly above water jacket cover between Nos. 1 and 2 cylinders.

ENGINE:—Eight cylinder, 'L' head type, $3\frac{1}{2} \times 5$ " bore and stroke, 384.84 cubic inch displacement, rated at 39.2 H.P., develops 135 H.P. at 3200 R.P.M. (standard compression Red Head engine), or 125 H.P. at 3400 R.P.M. (optional low compression Silver Dome engine). Standard compression ratio (Red Head engine) 5.8-1. Optional low compression ratio (Silver Dome engine) 5.2-1. Distinct ignition settings and spark plugs are used for each type engine and with each type distributor (see Timing).

BATTERY:—Willard, Type WH-5-19, 6 volt, 17 plate, 153 ampere hour capacity (20 hour rate). Starting capacity 180 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to engine.

Mounting:—In cradle on outside of right hand frame side rail under right front fender.

Dimensions:—Width, 7 $\frac{1}{16}$ ". Length, 13". Height, $9\frac{3}{4}$ ".

IGNITION:—Coil Model 534-R. Lock coil type with ignition switch in base. Coil mounted on back of instrument board at extreme left.

Ignition Current:—5-2.5 amperes at 6 volts (engine running), 4.5 amperes at 6 volts (engine stopped).

Ignition Switch:—Located in base of coil. Gasoline gauge and starter co-incident control are connected to accessory terminal on coil and are operative only with ignition switch turned on.

Distributor Model 661-F (first cars), 661-U (later cars). Single breaker, 8-lobe cam, full automatic advance type (distributor fitted with manual advance of 25° (engine) but this is set in timing distributor and no means is provided for manually advancing or retarding distributor in service). No synchronization is required.

Breaker Gap:—Set contact gap at .018". Hold within limits of .017-.022".

Breaker Arm Spring Tension:—19-23 ounces measured at point directly behind contacts with spring scale at right angles to back of breaker arm.

Automatic Advance—Model 661-F			
Engine	Distributor	Distributor	Engine
0.....	Start.....	400.....	800
18.....	9.....	1250.....	2500
Automatic Advance—Model 661-U			
2.....	Start.....	250.....	500
14.....	7.....	400.....	800
32.....	16.....	1400.....	2800

Mounting:—Distributor mounted on right hand side of cylinder head. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

Oiling:—500 Miles. Turn down grease cup on side of shaft housing one full turn. Keep cup filled with short-fibre cup grease.

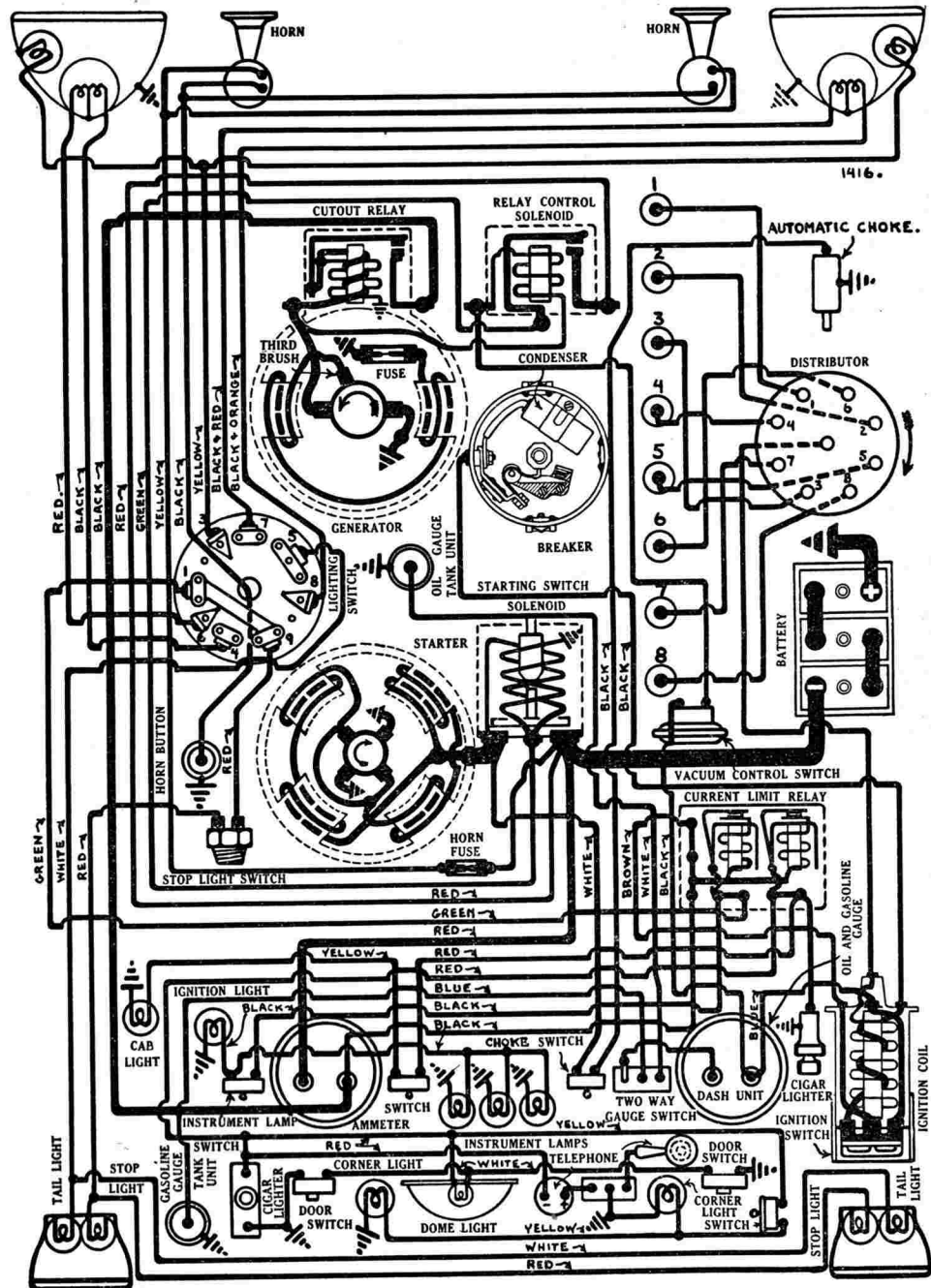
2000 Miles. Take off distributor cap and rotor, put 4-5 drops light engine oil in wick oiler in center of shaft, put one drop oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard settings for Red Head and Silver Dome engines with each type distributor are as follows:

Engine Type	Distributor Type	Ignition Setting
Red Head Engine.....	661-F.....	.038" before top dead center
Silver Dome Engine.....	661-F.....	.038" before top dead center
Red Head Engine.....	661-U.....	.004" after top dead center.
Silver Dome Engine.....	661-U.....	At top dead center.

To Set Ignition Timing. Take out $\frac{1}{8}$ -inch pipe plug in cylinder head directly over No. 8 piston and install regular Chrysler timing gauge. With No. 1 piston on compression stroke, turn engine over until piston reaches firing position with gauge reading as indicated in above table for the particular type engine. Then loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.



CHRYSLER

CUSTOM IMPERIAL EIGHT, MODEL CL* (1933)

DELCO-REMY SYSTEM

Spark Plugs:—14 MM. Metric. A.C. Type K-10 (Standard Red Head engines) or Type K-12 (optional Silver Dome engine). Set gaps at .025 inch.

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine is driven from the crankshaft by a two-sprocket non-adjustable chain drive. Sprockets are marked. To set timing, with crankshaft turned so that pistons Nos. 1 and 8 are on top dead center, mesh sprockets in chain so that marks on sprockets are adjacent and in line with a straightedge laid across the shaft centers. Camshaft sprocket cap screws are offset so that sprocket can only be mounted in correct position.

To Check Valve Timing. Take out 1/8-inch pipe plug in cylinder head over No. 8 piston and install regular Chrysler Timing Gauge. Set tappet clearance of No. 1 cylinder valves at .008" (intake), .009" (exhaust) with engine cold. With No. 8 piston on compression stroke, turn engine over until piston is slightly past top dead center and stop when gauge reading is .017". No. 1 intake valve should open at this point. Turn engine over 2° and stop with gauge reading of .030". No. 1 exhaust valve should close at this point. Reset tappet clearance at .005" (intake), .007" (exhaust) with engine warm.

Valve Specifications

	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 23/32" (1 9/16" clear)	11/32"	45°	5/16"
Exhaust	1 21/32" (1 7/16" clear)	11/32"	45°	5/16"

Tappet Clearance

	Operating	Timing		
Intake	.005" (hot)	.008" (cold)	Closed	50-55 pounds—2 3/4".
Exhaust	.007" (hot)	.009" (cold)	Compression Limits	2 1/8".

Valve Springs

Timing

Intake Valves		Exhaust Valves	
Open	6° after top dead center.	Open	42° before lower dead center.
Close	46° after lower dead center.	Close	8° after top dead center.

Valve Grinding. Valves should be refaced on a valve grinder and then lapped in the cylinder block. Ordinary reseating tool cannot be used on these inserts and they must be ground when necessary. Install valves with .001-.003" (intake), .002-.004" (exhaust) stem clearance in guides. Valve stem guides are removable.

CARBURETION:—Stromberg Downdraft Carburetor, Model EE-3 (see Carburetor Section for complete data). A Sisson Automatic Choke is standard equipment. Manifold heat control is automatic.

Air Cleaner:—Oil-wetted wire mesh type integral with silencer. Remove complete unit at 2000-mile intervals, clean by dipping cleaner end in pan of gasoline, dry thoroughly, re-oil by dipping in No. 50 engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical type combination fuel and vacuum pump mounted on right hand side of crankcase (see Equipment Section). Remove glass sediment bowl under pump at three-month intervals, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—Motometer electric combination gasoline and oil gauge (see Equipment Section). Gasoline gauge registers with ignition turned on. Oil reading is obtained by depressing button of selector switch at lower edge of instrument board.

STARTER:—Model 728-T. Starter drive—Through reduction gears, overrunning clutch, and mechanical pinion shift operated by solenoid mounted on starter field frame. Solenoid is controlled automatically by vacuum switch connected to throttle linkage and relay-solenoid mounted on generator (see 'Starter Controls' in Equipment Section for complete data on this equipment). Starter rotation clockwise (armature shaft) at commutator end. Brush spring tension 24-28 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5.0	70
28 "	Lock	3.0	600

Mounting:—Sleeve mounted on left hand front face of flywheel housing. To remove, disconnect cable and solenoid leads, loosen lock nut and take out

large pilot mounting screw in flywheel housing directly above starter sleeve. Pull starter forward to clear pinion housing, lift out.

Oiling:—6000 Miles. Put 8-10 drops light engine oil in oiler at each end.

10,000 Miles. Take out grease plug in reduction gear case, repack gears with graphite grease.

GENERATOR:—Model 967-A. Third brush regulation. Rotation counter-clockwise at commutator end. Manufacturer recommends that charging rate be set at 8 amperes (10 amperes on cars with radio) maximum charge to battery as indicated on dash ammeter with all lights on and engine operated at speed equivalent to 20 M.P.H.

Charging Rate Adjustment. Loosen small round lock screw on end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
17-19	7.9-8.1	1700	13-15	7.7-8.0	1800-2000

Brush Spring Tension:—24-28 ounces on each brush.

Field Current:—1.75-2.25 amperes at 6 volts across field terminals.

Field Fuse:—6 ampere capacity (after Serial No. 200).

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect leads, loosen adjustment clamp bolt, swing generator toward engine and slip off drive belt, take out two mounting bolts under generator forming bracket hinge, lift generator out.

Belt Adjustment. Attach spring scale by wire looped over generator field frame so that force of scale is tangent to top of generator and parallel to slot in adjustment arm. Pull generator away from engine until scale reading is 45-50 pounds, tighten adjustment clamp bolt before slacking off on scale.

Oiling:—2000 Miles. Fill oilers at each end with light engine oil.

RELAY:—Mounted on generator field frame. Consists of cut-out relay and special relay solenoid for control of starter pinion operating solenoid (see article in Equipment Section for complete data on relay solenoid). Cut-out relay contacts close when generator voltage reaches 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025". **Air Gap:**—.012-.017" with contacts closed.

Relay Solenoid:—Contacts close at 4.3-4.7 volts and will remain closed until battery voltage drops to 2.0 volts or less (when starter is cranking engine). Contacts open when difference in voltage between generator and battery is 2.0 volts or less. Contact gap limits .050-.055". Air gap limits .007-.009" with contacts closed.

LIGHTING:—**Clum Switch, Model 9454.** Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Lighting system uses standard double filament bulbs but switch has special 'passing' position with upper filament (depressed beam) of left hand headlight and lower filament (driving beam) of right hand headlight lighted (see wiring diagram).

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21	D.C.	1116
Parking Bulbs	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Lights	6-8	15	S.C.	87

CURRENT LIMIT RELAY:—Model 410-H. Consists of two vibrating circuit breakers mounted on the dash. Circuit breakers begin to operate with current load of 25-30 amperes limiting load to 2-15 amperes with direct short-circuit.

Contact Gap:—.012-.030". **Air Gap:**—.015-.025" with contacts closed.

Spring Tension:—5 ounces minimum measured at brass button with spring scale at right angles to contact arm.

HORNS:—**Klaxon Model K-26, Type 1505 (low note), Type 1506 (high note).** Vibrator type matched tone twin horns. Current draw 6.0-8.5 amperes at 6.0 volts (Type 1505), 5.0-6.5 amperes at 6.0 volts (Type 1506).

CONTINENTAL

FOUR CYLINDER BEACON MODEL (1933), SERIAL NUMBERS 40-1001 UP AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—On plate on upper toeboard. First serial number 40-1001.

ENGINE NUMBER:—On plate on left hand side of crankcase. First serial number C400-101.

ENGINE:—Four cylinder, 'L' head type, 3 $\frac{3}{8}$ x4" bore and stroke, 143.12 cubic inch displacement, rated at 18.22 H.P., develops 40 H.P. at 2800 R.P.M. Standard compression ratio 5.05-1. Optional compression ratios are not offered.

BATTERY:—U.S.L. Frontier, Type A-13-A, 6 volt, 13 plate, 78 ampere hour capacity (5 ampere rate). Starting capacity 90 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to transmission.

Mounting:—In cradle on left hand frame side rail under front floor.

Dimensions:—Width, 7". Length, 9". Height, 8 $\frac{5}{8}$ ".

IGNITION:—Coil Model IG-4606. Coil mounted on dash. Assembled as unit with ignition switch by means of armored cable on primary lead.

Ignition Current:—1-3 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped).

Ignition Switch:—Electrolock Type 16-S. Assembled as unit with coil. Stop light connected to ignition switch and operative only with switch turned on.

Distributor Model IGB-4202. Single breaker, four lobe cam, full automatic advance type. Breaker contacts adjusted by loosening lock nut on stationary contact mounting stud, turning up stud, and tightening lock nut.

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.020".

Breaker Arm Spring Tension:—16-22 ounces measured at tip of breaker arm with spring scale at right angles to back of arm.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0.....	Start.....	250.....	500		
6.....	3.....	340.....	680		
10.....	5.....	400.....	800		
16.....	8.....	700.....	1400		
20.....	10.....	900.....	1800		
24.....	12.....	1100.....	2200		
26.....	13.....	1200.....	2400		

Mounting:—Distributor mounted on cylinder head. To remove, disconnect breaker lead, take off distributor cap, take out hold-down screw in advance plate, lift distributor out.

Oiling:—500 Miles. Put 4-5 drops S.A.E. #20 engine oil in oiler.

1000 Miles. Take off distributor cap and rotor, put one drop of oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

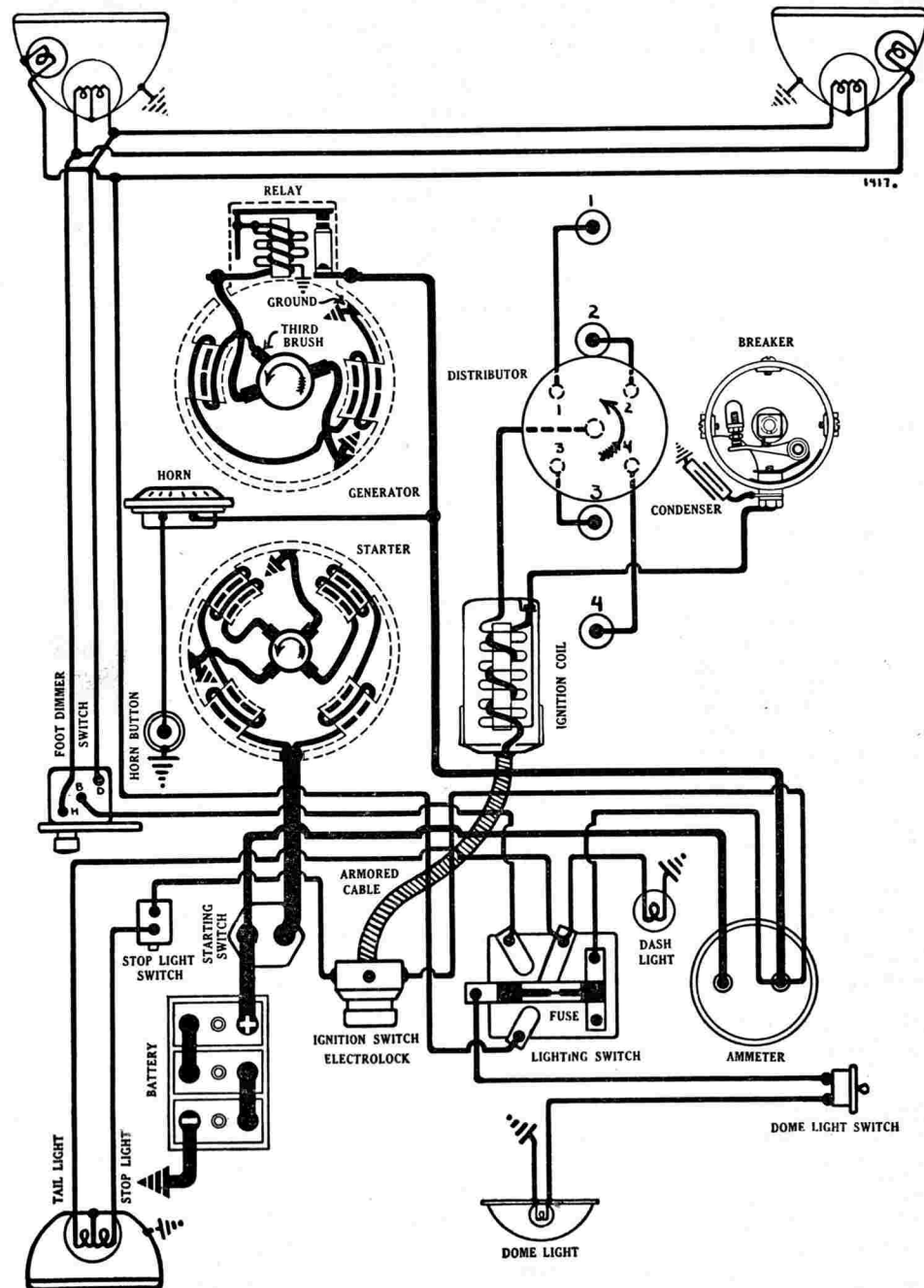
IGNITION TIMING:—Standard setting 4° (flywheel) or .00628" (piston travel) before top dead center.

To Set Ignition Timing. With No. 1 piston on compression, turn engine over by hand until flywheel mark 'IGN/' (which is 4° or .349" before top dead center mark 'DC') registers with indicator on edge of inspection hole in left hand front face of flywheel housing. Then loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-3-4-2. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. A.C. Type G-10. Set gaps at .025-.030".

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is driven by two-sprocket non-adjustable chain drive from the crankshaft. Sprockets are marked and camshaft setting "9 links" is stamped on front end plate in chain case. Mesh sprockets in chain so that there are 9 links or 10



CONTINENTAL

FOUR CYLINDER BEACON MODEL (1933), SERIAL NUMBERS 40-1001 UP AUTO-LITE SYSTEM

chain pins between the marks on the sprockets (begin count with pin in line with tooth meshed opposite mark on crankshaft sprocket and mesh the tooth in line with the tenth pin opposite mark on camshaft sprocket).

To Check Valve Timing. With No. 1 piston on top dead center, set tappet clearance of No. 1 exhaust valve at .012". Turn engine over one complete revolution and stop with piston slightly past top dead center when flywheel mark 'EX.CL.#1' registers with indicator in inspection hole in left hand front face of flywheel housing. No. 1 exhaust valve should close at this point. Reset tappet clearance at .006-.008" with engine warm.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 31/64"	5/16"	3 29/32"	45°	281"
Exhaust	1 17/64"	5/16"	3 29/32"	45°	281"

Tappet Clearance

Operating	Timing
Intake .006-.008" (hot).	
Exhaust .006-.008" (hot) .012" (cold).	

Valve Springs

Closed	Open
Intake .006-.008" (hot).	33.2 pounds.
Exhaust .006-.008" (hot) .012" (cold).	73 pounds.

Intake Valves

Timing	Exhaust Valves
Open—At top dead center.	Open—35° before lower dead center.
Close—40° after lower dead center.	Close—5° after top dead center.

CARBURETION:—Marvel Updraft Carburetor, Model AC (see Carburetor Section for complete data). Choke is controlled manually by button on instrument panel.

Air Cleaner:—Cap on air cleaner should be removed at 5000-mile intervals and screen cleaned by washing in gasoline. In replacing cap see that opening points toward rear of engine.

Fuel Pump:—A.C. Mechanical type fuel pump mounted on right hand side of crankcase and operated by eccentric on camshaft (see Equipment Section for complete data). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model MZ-4034. Starter drive—Inboard Bendix. Starter Switch Model SW-4001 is mounted on upper right hand toeboard. Starter rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4900	5.5	47
.65 "	2500	5.5	100
2.55 "	1325	5.0	200
4.95 "	750	4.5	300
7.65 "	220	4.0	400
10.1 "	Lock	3.5	470
12.25 "	Lock	4.0	545

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect cable, take out flange mounting cap screws, pull starter forward to clear Bendix, lift out.

Oiling:—500 Miles. Put 5-6 drops S.A.E. #20 engine oil in commutator end oiler. Drive end bearing is oilless.

GENERATOR:—Model GAM-4505. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate 17 amperes (cold) at 8.0 volts reached at 2400 R.P.M.

Charging Rate Adjustment:—Take off commutator cover band, shift third brush by prying on brush mounting stud, counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate held in position by friction.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	700	0	6.4	760
4	6.9	880	4	6.9	1040
7	7.0	1000	8	7.3	1400
10	7.2	1180	10	7.5	1600
14	7.8	1520	12.8	7.9	2550
17	8.0	2375	12.2	7.8	3200
15.2	7.9	3200			

Brush Spring Tension:—18-22 ounces on each brush.

Field Current:—4.08-4.52 amperes at 6.0 volts across field terminals.

Motoring:—4.94-5.46 amperes at 6.0 volts.

Mounting:—Cradle mounted at left front of engine with fan belt drive. Water pump is driven by extension of generator shaft. To remove, disconnect water pump drive coupling, disconnect lead, loosen belt adjustment and slip off drive belt, loosen mounting clamp band and lift generator out.

Belt Adjustment:—To take up fan belt, loosen large nut holding fan on bracket, lift fan up until fan can just be turned with belt held stationary, tighten mounting nut.

Oiling:—500 Miles. Put 5-6 drops S.A.E. #20 engine oil in oiler at each end.

RELAY:—Model CB-4014. Mounted on generator field frame. Relay contacts close when generator voltage reaches 7.0-7.5 volts and open with discharge current of .5-2.5 amperes.

Contact Gap:—.025-.035". **Air Gap:**—.010-.030" with contacts closed.

LIGHTING:—Soreng-Manegold Switch, Model 5670-AA. **Dimmer Switch Model C-2100-A.** Lighting switch mounted on back of instrument board and controlled by push-pull button at lower right center of instrument panel. Double filament headlight bulbs are used for 'depressed beam' dimming and are controlled by foot-operated dimmer switch on toeboard. Stop and tail light is fitted with double filament bulb.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Light	6-8	21-2	D.C.	1158
Dome Light	6-8	3	S.C.	63

FUSES:—Lighting fuse mounted on back of lighting switch is 20 ampere capacity.

HORNS:—Schwartz Vibrator type disc horn.

CONTINENTAL

SIX CYLINDER FLYER MODEL (1933), SERIAL NUMBERS 60-1001 UP AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—On plate on upper toeboard. First serial number 60-1001.

ENGINE NUMBER:—On plate on left side of crankcase. First serial number C600-101.

ENGINE:—Six cylinder, 'L' head type, 3x4" bore and stroke, 169.64 cubic inch displacement, rated at 21.6 H.P., develops 66 H.P. at 3500 R.P.M. Standard compression ratio 5.21-1. Optional compression ratios are not offered.

BATTERY:—U.S.L., Niagara Type XY-13A, 6 volt, 13 plate, 88 ampere hour capacity (5 ampere rate). Starting capacity 102 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to transmission.

Mounting:—In cradle on left hand frame side rail under front floor.

Dimensions:—Width, 7¼". Length, 9". Height, 8⅝".

IGNITION:—Coil Model IG-4606. Coil mounted on dash. Assembled as unit with ignition switch by means of armored cable on primary lead.

Ignition Current:—1-3 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped).

Ignition Switch:—Electrolock, Type 16-S. Assembled as unit with coil (see Equipment Section for data). Stop light connected to ignition switch and operative only with switch turned 'on'.

Distributor Model IGB-4083. Single breaker, 6-lobe cam, full automatic advance type. Breaker contacts adjusted by loosening lock nut on stationary contact mounting stud and turning up stud.

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.020".

Breaker Arm Spring Tension:—16-22 ounces measured at tip of breaker arm with spring scale at right angles to back of arm.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0.....	Start	275.....	550		
6.....	3	550.....	1100		
12.....	6	840.....	1680		
18.....	9	1120.....	2240		
22.....	11	1300.....	2600		

Mounting:—Distributor mounted on cylinder head between Nos. 4 and 5 cylinders. To remove, disconnect breaker lead, take off distributor cap, take out hold-down screw in advance plate, lift distributor out.

Oiling:—500 Miles. Put 5-6 drops S.A.E. #20 engine oil in oiler.

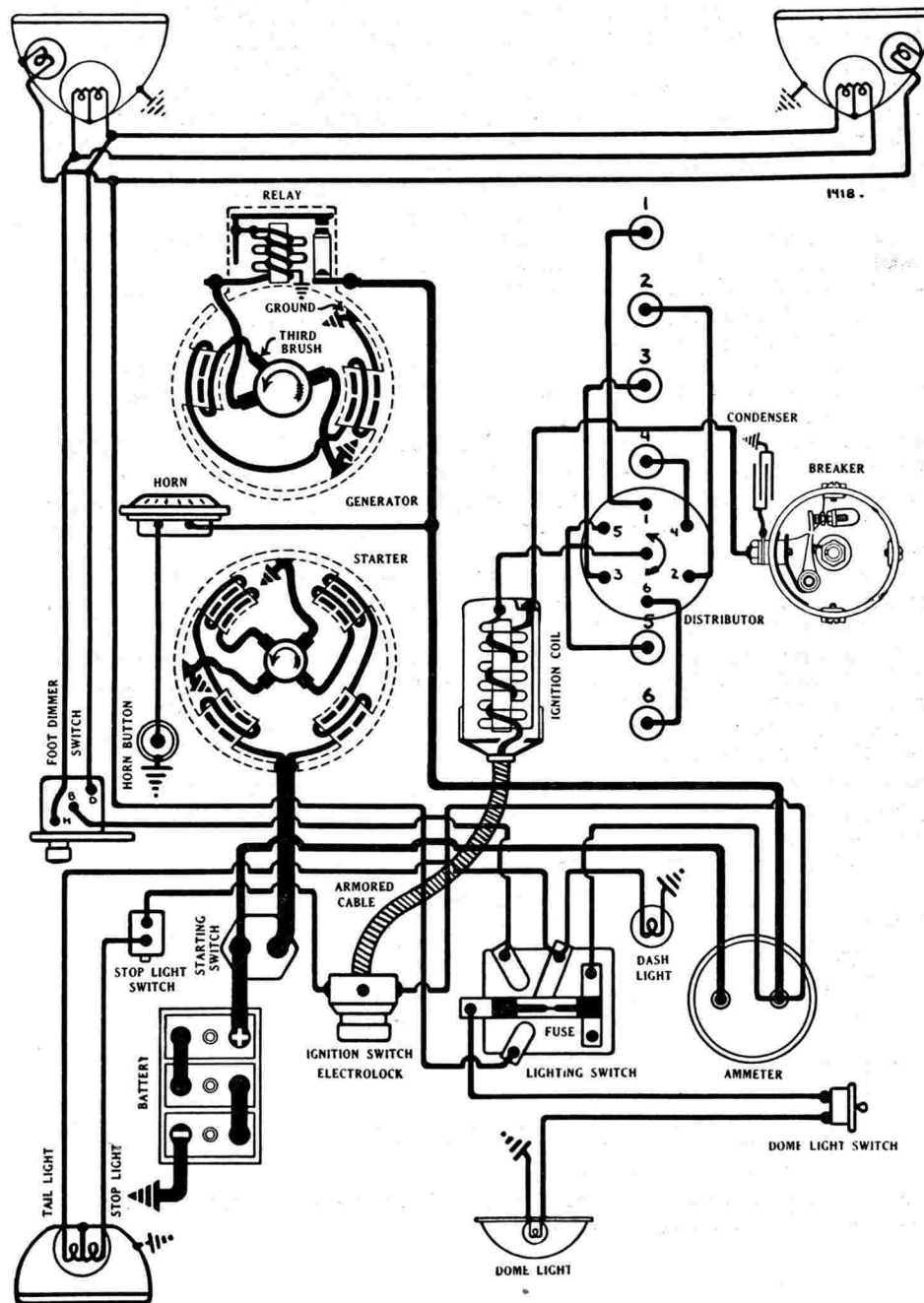
1000 Miles. Take off distributor cap and rotor, put one drop of oil on breaker arm pivot pin, apply thin film of vaseline on face of breaker cam.

IGNITION TIMING:—Standard Setting 2° (flywheel) or .0015" (piston travel) before top dead center.

To Set Ignition Timing. With No. 1 piston on compression stroke turn engine over by hand until flywheel mark 'IGN/' (which is 2° or .175" before top dead center mark 'DC') registers with indicator in inspection hole in left hand front face of flywheel housing. Then loosen advance plate clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. A.C. Type G-10. Set gaps at .025-.030".



CONTINENTAL

SIX CYLINDER FLYER MODEL (1933), SERIAL NUMBERS 60-1001 UP AUTO-LITE SYSTEM

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is driven by two-sprocket non-adjustable chain drive from the crankshaft. Sprockets are marked and camshaft setting "9 links" is stamped on front end plate in chain case. Mesh sprockets in chain so that there are 9 links or 10 chain pins between the marks on the sprockets (begin count with pin in line with tooth meshed opposite mark on crankshaft sprocket and mesh the tooth in line with the tenth pin opposite mark on camshaft sprocket).

To Check Valve Timing. With No. 1 piston on top dead center entering power stroke, set tappet clearance of No. 1 exhaust valve at .012". Turn engine over one complete revolution and stop with piston slightly past top dead center when flywheel mark 'EX.CL.#1' registers with indicator in inspection hole in left hand front face of flywheel housing. No. 1 exhaust valve should close at this point. Reset tappet clearance at .006-.008" running clearance with engine warm.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 21/64"	5/16"	3 29/32"	45°	.246"
Exhaust	1 17/32"	5/16"	3 29/32"	45°	.246"

Tappet Clearance

Operating	Timing
Intake	.006-.008" (hot).
Exhaust	.006-.008" (hot), .012" (cold).

Valve Springs

Operating	Timing
Intake	Closed .....33.2 pounds.
Exhaust	Open .....73 pounds.

Intake Valves	Timing	Exhaust Valves
Open—At top dead center.	Open—50° before lower dead center.	
Close—45° after lower dead center.	Close—6° after top dead center.	

CARBURETION:—Marvel Downdraft Carburetor, Model B (see Carburetor Section for complete data). Choke is controlled manually by button on instrument panel.

Air Cleaner:—Cap on air cleaner should be removed at 5000-mile intervals and screen cleaned by washing in gasoline. In replacing cap be sure that opening in cap points toward rear of engine.

Fuel Pump:—A.C. Mechanical type mounted on right hand side of crankcase and driven by eccentric on camshaft. Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (directly above bowl) before reassembling.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model MZ-4034. Starter drive—Inboard Bendix. Starter Switch Model SW-4001 is mounted on upper right hand toeboard. Starter rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4900	5.5	47
.65 "	2500	5.5	100
2.55 "	1325	5.0	200
4.95 "	750	4.5	300
7.65 "	220	4.0	400
10.1 "	Lock	3.5	470
12.25 "	Lock	4.0	545

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect cable, take out flange mounting cap screws, pull starter forward to clear Bendix, lift out.

Oiling:—500 Miles. Put 5-6 drops S.A.E. #20 engine oil in commutator end oiler. Drive end bearing is oilless.

GENERATOR:—Model GAM-4505. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate 17 amperes (cold) at 8.0 volts reached at 2400 R.P.M.

Charging Rate Adjustment:—Take off commutator cover band, shift third brush by prying on brush mounting stud, counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate held in position by friction.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	700	0	6.4	760
4	6.9	880	4	6.9	1040
7	7.0	1000	8	7.3	1400
10	7.2	1180	10	7.5	1600
14	7.8	1520	12.8	7.9	2550
17	8.0	2375	12.2	7.8	3200
15.2	7.9	3200			

Brush Spring Tension:—18-22 ounces on each brush.

Field Current:—4.08-4.25 amperes at 6.0 volts across field terminals.

Motoring:—4.94-5.46 amperes at 6.0 volts.

Mounting:—Cradle mounted at left front of engine with fan belt drive. Water pump is driven by extension of generator shaft. To remove, disconnect water pump drive coupling, disconnect lead, loosen belt adjustment and slip off drive belt, loosen mounting clamp band and lift generator out.

Belt Adjustment:—To take up fan belt, loosen large nut holding fan on bracket, lift fan up until fan can just be turned with belt held stationary tighten mounting nut.

Oiling:—500 Miles. Put 5-6 drops S.A.E. #20 engine oil in oiler at each end.

RELAY:—Model CB-4014. Mounted on generator field frame. Relay contacts current of .5-2.5 amperes.

Contact Gap:—.025-.035". Air Gap:—.010-.030" with contacts closed.

LIGHTING:—Soreng-Manegold Switch, Model 5670-AA. Dimmer Switch Model C-2100-A. Lighting switch mounted on back of instrument board and controlled by push-pull button at lower right center of instrument panel. Double filament headlight bulbs are used for 'depressed beam' dimming and are controlled by foot-operated dimmer switch on toeboard. Stop and tail light is fitted with double filament bulb.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Light	6-8	21-2	D.C.	1158
Dome Light	6-8	3	S.C.	63

FUSES:—Lighting fuse mounted on back of lighting switch is 20 ampere capacity.

HORNS:—Schwartz Vibrator type disc horn.

CONTINENTAL

SIX CYLINDER ACE MODEL 81 (1933), SERIAL NUMBERS 81-1001 UP AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—On plate on right hand side of upper toeboard.

ENGINE NUMBER:—On plate on right hand side of crankcase. First serial number 41A-101.

ENGINE:—Six cylinder, 'L' head type, $3\frac{3}{8} \times 4$ " bore and stroke, 214.7 cubic inch displacement, rated at 27.34 H.P., develops 85 H.P. at 3600 R.P.M. Standard compression ratio 5.25-1. Optional ratios are not offered.

BATTERY:—National, Type H3-15X, 6 volt, 15 plate, 100 ampere capacity (20 hour rate). Starting capacity 119 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to transmission.

Mounting:—On left hand side of frame under driver's seat.

Dimensions:—Width, $7\frac{1}{8}$ ". Length, $10\frac{7}{16}$ ". Height, $8\frac{13}{16}$ ".

IGNITION:—Coil Model IG-4310. Lock coil type with ignition switch in base. Coil mounted on back of instrument board with switch projecting through to face of instrument panel.

Ignition Current:—1-3 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped).

Ignition Switch:—Yale & Towne Lock cylinder. Switch built in base of coil. Gasoline gauge and stop light are connected to accessory terminal on coil and are controlled by ignition switch (operative only with switch turned on).

Distributor Model IGB-4084 or IGB-4085. Single breaker, 6-lobe cam, full automatic advance type. Breaker contact gap adjusted by loosening lock nut on stationary contact mounting stud and turning up stud.

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.020".

Breaker Arm Spring Tension:—16-22 ounces measured at tip of breaker arm with spring scale at right angles to back of arm.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0.....	Start.....	275.....	550		
8.....	4.....	450.....	900		
15.....	$7\frac{1}{2}$	600.....	1200		
20.....	10.....	1025.....	2050		
24.....	12.....	1350.....	2700		
27.....	$13\frac{1}{2}$	1600.....	3200		

Mounting:—Distributor mounted on cylinder head between Nos. 3 and 4 cylinders. To remove, disconnect breaker lead, take off distributor cap, take out hold-down screw in advance plate, lift distributor out.

Oiling:—500 Miles. Put 4-5 drops S.A.E. #20 engine oil in oiler.

1000 Miles. Take off distributor cap and rotor, put one drop oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

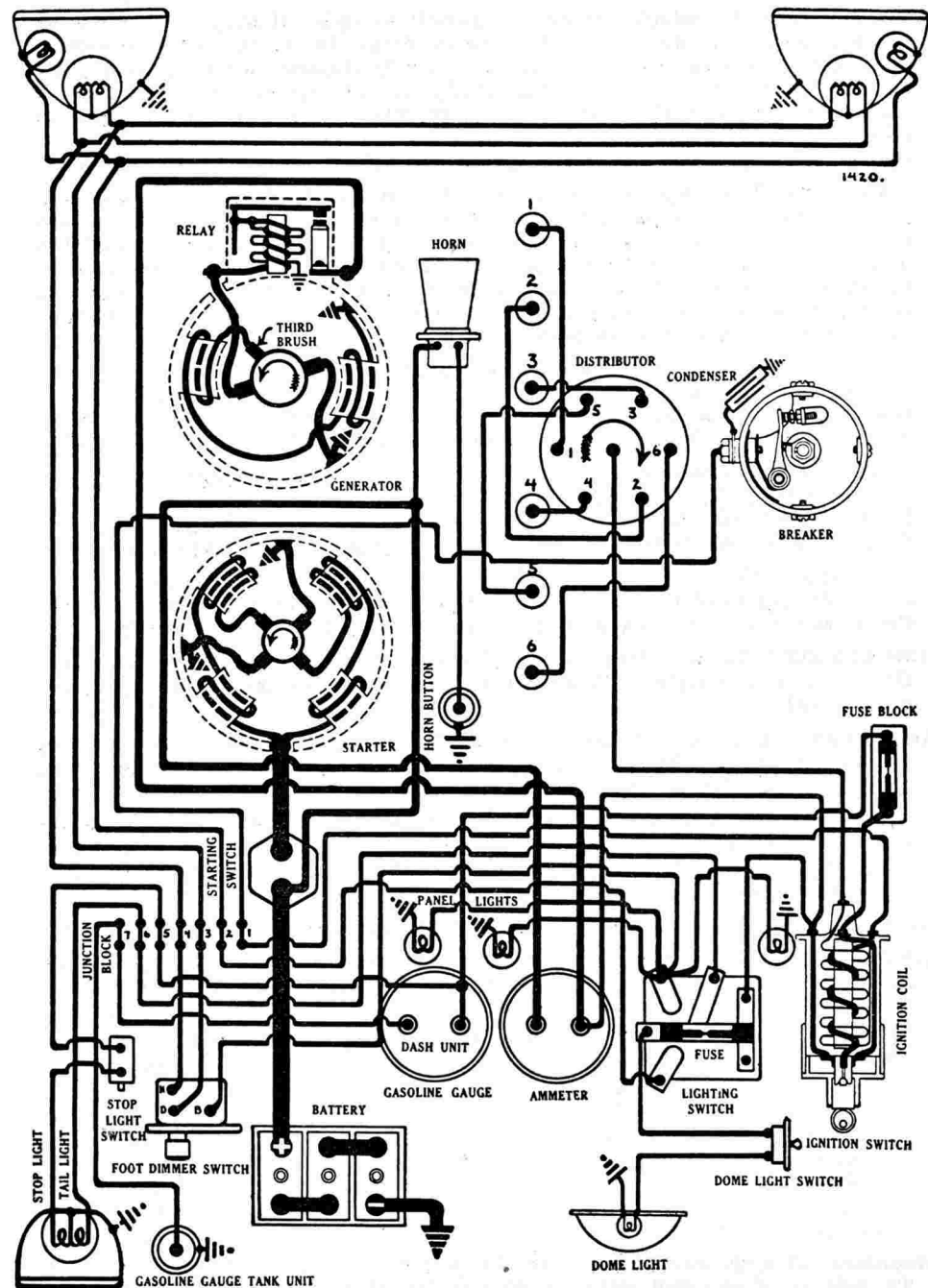
IGNITION TIMING:—Standard setting—On top dead center or .000" piston travel.

To Set Ignition Timing. With No. 1 piston on compression stroke, turn engine over until piston reaches top dead center with 'DC' mark at indicator in inspection hole in left hand front face of flywheel housing. Then loosen advance plate clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. A.C. Type G8. Set gaps at .025-.030".

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is driven by two-sprocket non-adjustable chain drive from the crankshaft. Sprockets are marked. To set timing, with crankshaft turned so that No. 1 piston is at top dead center, mesh sprockets in chain so that there are exactly nine



CONTINENTAL

SIX CYLINDER ACE MODEL 81 (1933), SERIAL NUMBERS 81-1001 UP AUTO-LITE SYSTEM

links or ten pins between marks on sprockets (begin count with pin in line with tooth meshed opposite mark on crankshaft sprocket and mesh tooth in line with tenth pin opposite mark on camshaft sprocket).

To Check Valve Timing. With No. 1 piston on top dead center entering power stroke, set tappet clearance of No. 1 exhaust valve at .012". Turn engine over one complete revolution and stop with piston 5° past top dead center when flywheel mark 'No.1EX.CL.' registers with indicator in inspection hole in left hand front face of flywheel housing. No. 1 exhaust valve should close at this point. Reset tappet clearance at .006-.008" with engine warm.

Valve Specifications

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 45/64"	11/32"	4 29/32"	45°	.344"
Exhaust	1 1/2"	11/32"	4 7/8"	45°	.344"

Tappet Clearance

Operating Timing

Intake	.006-.008" (hot).	Closed	45.6 pounds.
Exhaust	.006-.008" (hot) .012" (cold).	Open	108 pounds.

Intake Valves Timing

Open	5° before top dead center.	Open	40° before lower dead center.
Close	40° after lower dead center.	Close	5° after top dead center.

Valve Springs

CARBURETION:—Marvel Downdraft Carburetor, Model B (see Carburetor Section for complete data). Choke is controlled manually by button on instrument panel.

Air Cleaner:—A.C. oil-wetted wire mesh type. Remove complete unit at 2500-mile intervals, clean by dipping wire mesh portion in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical type mounted on right hand side of crankcase and driven by eccentric on camshaft. Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—Motometer electric type (see Equipment Section).

STARTER:—Model MAB-4037. Starter drive—Outboard Bendix. Starter switch Model SW-4003 is mounted on upper toeboard. Starter rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	46
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
17.0 "	Lock	3.0	525
24.0 "	Lock	4.0	725

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect cable, take out flange mounting screws, pull starter forward to clear Bendix housing, lift out.

Oiling:—1000 Miles. Put 5-6 drops S.A.E. #20 engine oil in oiler at each end of armature shaft. Outer bearing (outer end of Bendix housing) is oilless.

GENERATOR:—Model GAL-4330. Third brush regulation. Rotation counter-

clockwise at commutator end. Maximum charging rate is 17 amperes (cold) at 8.0 volts reached at 1900 R.P.M.

Charging Rate Adjustment. Take off commutator cover band, shift third brush by prying on brush mounting stud counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in place by friction.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	600	0	6.4	700
4	6.7	740	4	6.9	900
8	7.1	900	8	7.4	1150
12	7.4	1120	10	7.7	1340
17	8.0	1900	12.4	8.0	2150
12	7.4	3200	9.5	7.7	3200

Brush Spring Tension:—8-13 ounces on each brush.

Field Current:—4.08-4.52 amperes at 6.0 volts across field terminals.

Motoring:—4.27-4.73 amperes at 6.0 volts.

Mounting:—Cradle mounted at left of engine with fan belt drive. Water pump is driven by extension of generator shaft. To remove generator, disconnect water pump drive coupling, disconnect lead, slack off belt adjustment and slip off drive belt, loosen mounting clamp band, lift generator out.

Belt Adjustment. To take up drive belt, loosen nut on rear of fan shaft stud, raise fan until fan can just be turned with belt held stationary, tighten mounting nut.

Oiling:—500 Miles. Put 5-6 drops S.A.E. #20 engine oil in oiler at each end. 5000 Miles. Remove grease cup under bearing retainer on commutator end of generator, clean out all old grease, fill cup with medium cup grease, dip wick in light engine oil before reassembling.

RELAY:—Model CB-4014. Mounted on generator field frame. Contacts close at 675 R.P.M. when generator voltage reaches 7.0-7.5 volts with charging current of approximately 2 amperes and open with discharge current of .5-2.5 amperes.

Contact Gap:—.025-.035". **Air Gap:**—.010-.030" with contacts closed.

LIGHTING:—Soreng-Manegold Switch, Model 5670-AA. Dimmer Switch Clum Model 9251 or Soreng-Manegold Model C-2100-A. Lighting switch mounted on back of instrument board and controlled by push-pull button on instrument panel. Double filament headlight bulbs are used for 'depressed beam' dimming and are controlled by foot-operated dimmer switch on toeboard. Stop and tail light is fitted with double filament bulb.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome Light	6-8	3	S.C.	63

FUSES:—20 ampere capacity lighting fuse mounted on back of lighting switch. 20 ampere capacity fuse mounted on fuse block on back of instrument board.

HORNS:—Sparton Vibrator type horn. Twin horns are optional.

CUNNINGHAM

SERIES V-10 (1933)

DELCO-REMY GENERATING, STARTING SYSTEM NORTH EAST IGNITION

CAR SERIAL NUMBER:—On left hand frame side rail near front motor arm.

ENGINE NUMBER:—On left front motor arm.

ENGINE:—Eight cylinder, 90 degree 'V' eight, 'L' head type, $3\frac{3}{8} \times 5$ " bore and stroke, 47 $\frac{1}{2}$ cubic inch displacement, rated at 48 H.P., develops 140 H.P. at 2800 R.P.M. Standard compression ratio 5.00-1. Optional high compression ratio 5.63-1 available.

BATTERY:—Willard, Type RH-4-17, 6 volt, 17 plate, 136 ampere hour capacity (20 hour rate). Starting capacity 160 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—In cradle under right front seat.

Dimensions:—Width, 7 $\frac{1}{16}$ ". Length, 11 $\frac{11}{16}$ " Height, 9 $\frac{5}{16}$ ".

IGNITION:—Coil Type 5023660. Lock coil type mounted on back of instrument board.

Ignition Current:—4.75 amperes at 6 volts (engine stopped), 2.75 amperes with engine running at 400 R.P.M. decreasing to .8 ampere at 4000 R.P.M.

Distributor Type 10874. Two breaker arm, 8 lobe cam, semi-automatic advance type. Manual advance 40° (engine). Breaker contacts open simultaneously at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Timing). Breaker contact gap adjusted by loosening lock nut on stationary contact stud, turning up stud, tightening lock nut.

Contact Gap:—.018 inch. Hold within limits of .018-.020 inch. Gaps of both sets of contacts must be exactly the same.

Breaker Arm Spring Tension:—16 ounces on each breaker arm.

Engine	Degrees	Automatic Advance	R.P.M.	Engine
0.....	Start.....	Distributor	300.....	600
16.....	8	1500.....		3000

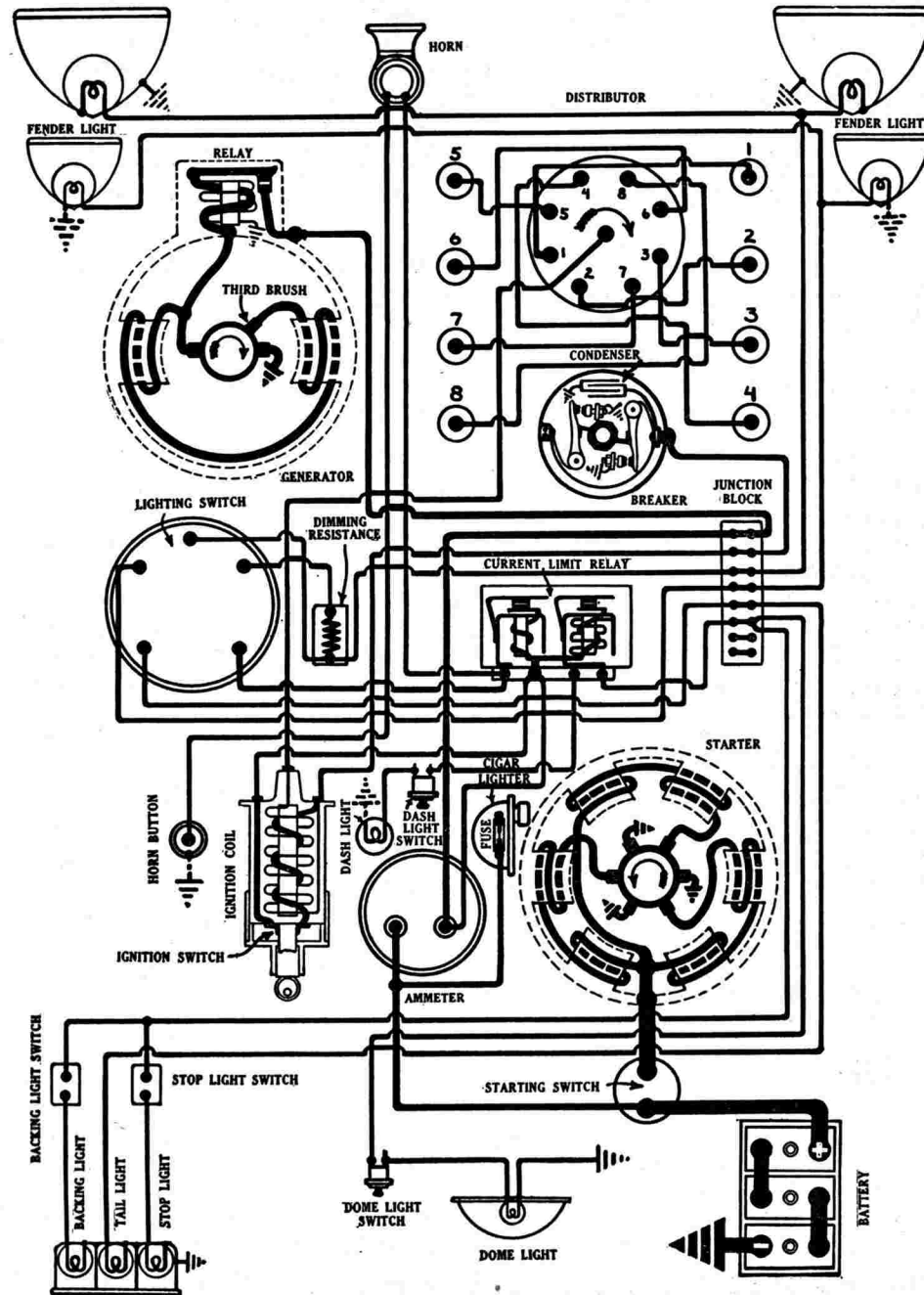
Mounting:—Distributor mounted at front of engine between cylinder banks. To remove, disconnect primary lead, disconnect manual spark control, take off distributor cap, take out mounting screw, lift distributor out.

Oiling:—1000 Miles. Turn down grease cup on side of shaft one turn. Keep cup filled with medium cup grease. Take off distributor cap and rotor, put one drop oil on breaker arm pivot pins, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting $1\frac{1}{2}$ " or 11-12' (flywheel) or .059" (piston travel) after top dead center with manual spark control retarded.

To Set Ignition Timing:—Retard manual spark control, take off cover plate over inspection hole in flywheel housing. With No. 1 piston (right hand bank) on compression, turn engine over until a point on the flywheel $1\frac{1}{2}$ " past the top dead center mark '#1 UP' registers with the indicator on the flywheel housing. Loosen advance arm clamp bolt, rotate distributor until both sets of contacts begin to open (contacts must be properly synchronized), tighten clamp bolt, see that rotor is opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated.

Synchronization of Contacts. Contacts must be synchronized whenever ignition timing is checked or contacts adjusted. Use test lamps connected across each set of contacts to determine opening point. Breaker plate is



CUNNINGHAM

SERIES V-10 (1933)

DELCO-REMY GENERATING, STARTING SYSTEM

NORTH EAST IGNITION

constructed with .020" clearance within housing so that entire plate may be shifted after two lockscrews have been loosened. To synchronize contacts, loosen lock screws, shift plate until both sets of contacts open at same instant (lights should come on simultaneously), tighten lock screws. See Equipment Section for complete data on Synchronization.

Firing Order:—1-5-4-8-6-3-7-2 with cylinders numbered as shown on diagram, or 1R-1L-4R-4L-2L-3R-3L-2R with cylinder banks right (R) and left (L) as viewed from driver's seat and No. 1 cylinder nearest radiator.

Spark Plugs:—7/18 SAE. Short body. Champion Type C-4. Set gaps at .031".

VALVE TIMING:—**Camshaft Setting.** Camshaft directly above crankshaft and gear driven from crankshaft. Camshaft gear—GE. Textolite. Crankshaft gear—steel. Mesh gears so that marks on both gears are directly opposite.

To Check Valve Timing. With No. 1R piston on top dead center entering power stroke, check tappet clearance No. 1 intake and exhaust valves and set at correct figure if necessary. Turn engine over slightly more than one complete revolution and stop with flywheel mark 'EX.C.IN.0' (which is 5° after top dead center mark '#1 UP') at indicator on housing. No. 1 intake valve should open and No. 1 exhaust valve close at this point. Flywheel is marked 'EX.C.IN.0' at a point 5° after top dead center mark '#5 UP'. This intake opening and exhaust closing point for piston No. 5.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	2"	.432"	6 5/32"	45°	.375"
Exhaust	1 7/8"	.432"	6 5/32"	45°	.375"

Tappet Clearance

Intake	.003" (cold)
Exhaust	.003" (cold)

Valve Springs

Under load—95 pounds—2 5/8"
Spring constructed with 12 1/2 coils

Intake Valves

Open—5° after top dead center
Close—51° after lower dead center

Timing

Open—41° before lower dead center
Close—5° after top dead center

Exhaust Valves

CARBURETION:—Stromberg Dual Downdraft Carburetor, Model DD-3. See Carburetor Section for complete data.

Fuel Pump:—If Autopulse electric pump is used on car, see Equipment Section for complete data.

Gasoline Gauge:—Grolan mechanical type gauge.

STARTER:—Model 350. Starter drive—Bendix. Rotation counter-clockwise at commutator end. Brush spring tension 36-40 ounces on each brush. Starter switch Model 406-G mounted on toeboard.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4000	4.0	60
19 "	Lock	3.0	500

Mounting:—Flange mounted on right hand forward face of flywheel housing. To remove, disconnect cable, take out 3 flange mounting screws, pull starter forward to clear Bendix, lift out.

Oiling:—Starter bearings oilless. They require no attention.

GENERATOR:—Model 285. Third brush regulation. Rotation clockwise at com-

mutator end. With standard car setting, maximum charging rate is 20 amperes (cold) at 8.3 volts reached at 1600 R.P.M. or 25 M.P.H.

Charging Rate Adjustment:—Take off commutator cover band, shift third brush by hand (there is a handle on the third brush plate for this purpose) clockwise to increase, or counter-clockwise to decrease charging rate. Third brush and mounting plate are held in position by friction.

Generator Data

Amperes	Volts	R.P.M.
3	.....	600
9	.....	800
18-20	8.3	1600.

Brush Spring Tension:—24-28 ounces on each brush.

Field Current:—3 amperes at 6 volts across field terminals.

Motoring:—Approximately 6 amperes at 6 volts.

Mounting:—Cradle mounted at front of engine and accessible from left side. To remove, disconnect lead, loosen mounting clamp band by taking off lock nut and holding nut on mounting band, slide generator out.

Oiling:—500 Miles. Put 8-10 drops light engine in oiler at each end.

RELAY:—Model 265-B. Mounted on generator field frame. Contacts close when generator voltage reaches 6.75-7.5 volts and open with discharge current of 0-2.5 amperes.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Delco-Remy Switch, Model 486-D. Lighting switch mounted at lower end of steering column controlled by lever on steering wheel. Headlights dimmed by resistance on dash, controlled by lighting switch.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21	S.C.	1129
Fender or Cowl Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop and Backing Light	6-8	21	S.C.	1129
Dome and Corner Lights	6-8	3	D.C.	64

NOTE:—Trouble lamp is plugged in on cigar lighter and is protected by cigar lighter fuse.

CURRENT LIMIT RELAY:—Model 5759. This unit consists of a vibrating and a lockout circuit breaker mounted on the dash. Vibrating circuit breaker begins to operate with current load of 35-40 amperes, limiting load to 5-20 amperes with direct short-circuit. Lockout circuit breaker begins to operate with a current load of 25-30 amperes, limiting current to less than 1 ampere.

Contact Gap:—.012-.030 inch. **Air Gap:**—.015-.025 inch (contacts closed).

Contact Arm Spring Tension:—5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

FUSES:—One 10 ampere capacity fuse mounted on cigar lighter reel.

HORNS:—Sparton vibrator type.

DE SOTO

MODEL SD (1933), SERIAL NUMBERS 5,056,001 UP
DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—Located on right hand front door hinge pillar post.
ENGINE NUMBERS:—Stamped on boss on left hand side of cylinder block between No. 1 and No. 2 cylinders. First number of this series SD-1001.

ENGINE:—Six cylinder, 'L' head type, $3\frac{1}{4} \times 4\frac{3}{8}$ " bore and stroke, 217.7 cubic inch displacement, rated at 25.35 H.P., develops 79 H.P. at 3400 R.P.M. (Standard Silver Dome engine), or 86 H.P. at 3400 R.P.M. (high compression Red Head engine). Standard compression ratio (Silver Dome Head), 5.35-1. High compression ratio (Red Head engine), 6.2-1.

BATTERY:—Willard, Type WT-1-15, 6 volt, 15 plate, 90 ampere hour capacity (20 hour rate). Starting capacity 117 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to left front corner of transmission.

Mounting:—In cradle under driver's seat.

Dimensions:—Width, 7 $\frac{1}{16}$ ". Length, 9 $\frac{1}{16}$ ". Height, 8 $\frac{13}{16}$ ".

IGNITION:—Coil Model 537-S.Y. Mounted on dash and connected to ignition switch by armored cable.

Ignition Current:—5-1.5 amperes at 6 volts (engine running), 4-5 amperes at 6 volts (engine stopped).

Ignition Switch:—Unit with coil. Switch mounted on instrument panel and connected to coil by armored cable (primary lead).

Distributor Model 622-C (first cars), **644-J** (later cars). Single breaker, 6-lobe cam, full automatic advance type. Distributor mounted on outside of distributor contact mounting plate and turning eccentric adjusting screw.

Breaker Gap:—Set at .020". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—19-23 ounces measured at point directly behind contacts with spring scale at right angles to back of breaker arm.

Automatic Advance—Model 622-C

Degrees	Distributor	Distributor	R.P.M.	Engine
2	Start	400	800	
16	8	1300	2600	
Automatic Advance—Model 644-J				
2	Start	250	500	
15.2	7.6	420	840	
32	16	1400	2800	

Mounting:—Distributor mounted at left center of engine and driven by inclined shaft from the camshaft. To remove, disconnect breaker lead, take off distributor cap, take out hold-down screw in advance arm, lift out.

Oiling:—500 Miles. Turn down grease cup on side of shaft housing one full turn. Keep cup filled with medium cup grease.

2000 Miles. Take off distributor cap and rotor. Put 4-5 drops light engine oil in wick oiler in center of shaft, oil breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard settings for all engines as follows:

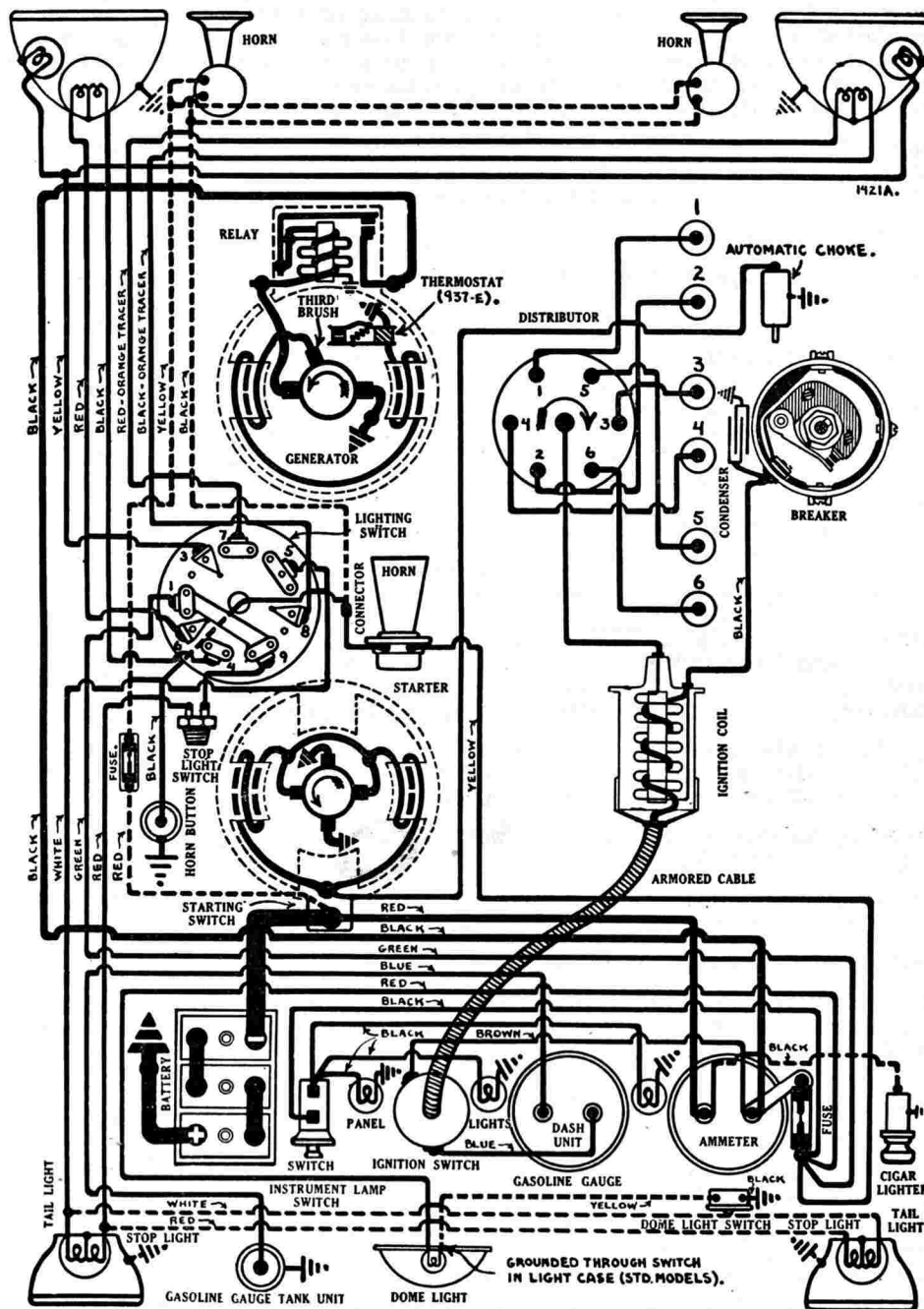
Engine Type	Distributor Type	Flywheel Degrees	Piston Travel
Silver Dome head	622-C	9° before TDC	.033"
Silver Dome head	644-J	At top dead center	TDC
Red Head Engine	622-C	7° before TDC	.0198"
Red Head Engine	644-J	6° after TDC	.0150"

To Set Ignition Timing. First remove cover plate over inspection hole in left front face of flywheel housing directly below starter. With No. 1 piston on compression stroke, turn engine over by hand until flywheel mark 'D/C' registers with upper pointer in inspection hole (when ignition setting is before top dead center) or with the dead center pointer (when ignition setting is at top dead center). Then loosen clamp bolt in advance arm, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated.

NOTE:—Where the distributor has been changed in the field or when the ignition pointer does not correspond with the correct setting, the timing gauge should be used.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—14 MM. Metric. A.C. Type K-12 (Standard Silver Dome engines), Type K-10 (high compression Red Head engines). Set gaps at .025".



DE SOTO

MODEL SD (1933), SERIAL NUMBERS 5,056,001 UP
DELCO-REMY SYSTEM

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is driven by two-sprocket non-adjustable chain drive. Sprockets are marked. To set timing, turn crankshaft so that pistons Nos. 1 and 6 are on top dead center with flywheel mark 'D/C' at lower pointer in inspection hole. Mesh sprockets in chain so that marks are adjacent and in line with a straightedge across the shaft centers. Camshaft sprocket mounting cap screws are offset so that sprocket can only be mounted in correct position.

To Check Valve Timing. Take out 1/8 inch pipe plug in cylinder head directly over No. 6 piston and install regular Chrysler Timing Gauge. With No. 1 piston on top dead center entering power stroke set tappet clearance of No. 1 intake valve at .011", No. 1 exhaust valve at .012". Turn engine over one complete revolution and stop with piston slightly past top dead center when gauge reads .015". No. 1 intake valve should begin to open at this point. Turn crankshaft 2° and stop when gauge reads .026". No. 1 exhaust valve should close at this point. Reset tappet clearance at .005" (intake), .007" (exhaust) with engine warm.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 17/32" (1 3/8" clear)	11/32"	45°	5/16"
Exhaust	1 15/32" (1 5/16" clear)	11/32"	45°	5/16"

Tappet Clearance

Operating	Timing	
Intake	.005" (hot) .011" (cold)	Closed—40-44 pounds—2 1/16".
Exhaust	.007" (hot) .012" (cold)	Compression Limit—1 3/4".

Timing

Intake Valves	Exhaust Valves
Open—6° after top dead center.	Open—42° before lower dead center.
Close—46° after lower dead center.	Close—8° after top dead center.

Valve Grinding:—Valve material chrome nickel steel (intake valves), sil-chrome steel (exhaust valves). Special alloy exhaust valve seat inserts are used in the cylinder block. Valves should be refaced on valve grinder and then lapped in block. Ordinary reseating tool cannot be used on exhaust valve inserts and these must be ground when necessary. Install valves with .001-.003" stem clearance in guide (intake valves), .003-.005" (exhaust valves). Stem guides are removable.

CARBURETION:—Carter Downdraft Carburetor, Model E6A (see Carburetor Section for complete data). Manifold heat control is automatic. Sisson Automatic Choke is standard equipment (see Carburetor Section).

Air Cleaner:—Oil-wetted wire mesh type integral with silencer. Remove complete unit from engine at 2000 mile intervals or oftener, clean by dipping wire mesh end of unit in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical type mounted at right of engine (see Equipment Section for complete data). Remove glass sediment bowl at three month intervals, empty water and sediment, clean filter screen (located directly above sediment bowl) before reassembling.

Gasoline Gauge:—Motometer Electric type (see Equipment Section for complete data).

STARTER:—Model 734-L, R, Model 727-B (R.H.D.). Starter drive, overrunning clutch and mechanical pinion shift connected to starting switch lever. Starter mechanism operated by accelerator pedal through selective clutch (Delco-Remy Selector, Model 1550—see Equipment Section for complete data on Selector). Starter rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces on each brush.

Starter Data—Model 734-L, R

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5.0	65
12 "	Lock	3.63	475

Starter Data—Model 727-B

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5500	5.0	65
15 "	Lock	3.0	600

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect cable, take out flange mounting screws, pull starter forward to clear pinion housing, lift out. See article on Selector in Equip-

ment Section for adjustment of pinion shift lever roller.

Oiling:—5000 Miles. Put 8-10 drops light engine oil in oiler on commutator end. Drive end bearing at outer end of pinion housing is oilless.

GENERATOR:—Model 943-S, 937-E—Radio cars (first 4250), 937-D, 937-F (Radio cars (after 4250)). Third brush regulation, thermostat control (937-E only). Thermostat contacts open at 175°F. reducing charging rate approximately 40%. Rotation counter-clockwise at commutator end. Manufacturer recommends that charging rate be set at 8 amperes (943-S, 937-D) or 10 amperes (937-E, F) maximum charge to battery as shown on dash ammeter with all lights on and engine operating at speed equivalent to 20 M.P.H.

Charging Rate Adjustment. Loosen small round lock screw on commutator end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data—Models 943-S, 937-D

Standard Setting				Maximum Output			
	Amperes	Volts	R.P.M.		Amperes	Volts	R.P.M.
Cold	16-17	7.9-8.1	2080	Cold	19-21	8.1-8.3	2300
Hot	13-15	7.7-8.0	2400	Hot	13-15	7.7-8.0	2400

Generator Data—Models 937-E, 937-F

Generator Data - Models 551-E, 551-F							
Cold	20-22	8.2-8.4	2100	Cold	22-24	8.4-8.6	2400
Hot	12-14	7.7-8.0	2800-3000	Hot	12-14	7.7-8.0	2800-3000

Brush Spring Tension:—24-28 ounces on each brush.

Field Current:—3.5-4.5 amperes at 6 volts across field terminals.

Field Fuse:—6 ampere capacity (943-S after Serial No. 30,000; 937-D after Serial No. 12,000).

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out two bolts forming bracket hinge, lift generator out.

Belt Adjustment. Attach spring scale by wire looped over generator field frame so that force of spring is tangent to top of generator and parallel to slot in adjustment clamp arm. Loosen adjustment clamp bolt and mounting bolts, pull generator away from engine until scale reading is 45-50 pounds, tighten adjustment clamp bolt and mounting bolts before slacking off on scale.

Oiling:—2000 Miles. Put 8-10 drops light engine oil in oiler at each end of generator (fill oilers once).

RELAY:—Model 265-G. Mounted on generator field frame. Contacts close when generator voltage reaches 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025". **Air Gap:—**.012-.017" (contacts closed).

LIGHTING:—Clum Switch, Model 9454. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Lighting system uses standard double filament headlight bulbs but switch has a special 'passing' position with depressed beam (upper filament) of left hand headlight and driving beam (lower filament) of right hand headlight lighted (see Wiring Diagram). Stop and tail light are equipped with double filament bulb (tail light lead must be connected to 2 cp. filament).

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21	D.C.	1116
Parking Bulbs	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome Light	6-8	15	S.C.	87

FUSES:—20 ampere capacity fuse mounted on back of instrument board near ammeter. A 20 ampere capacity fuse is assembled in a connector in the feed wire from the starter switch to the twin horns mounted under the headlights when these units are installed.

HORNS:—Klaxon Model K-31, Type 1364 (standard), Model K-26 Matched Set (optional equipment). Vibrator type horns. Current draw 4.0-6.5 amperes at 6 volts (K-31) 5.0-6.5 amperes at 6 volts (K-26, Type 1506—high note), 6.0-8.5 amperes at 6 volts (K-26, Type 1505—low note).

DODGE SIX

MODEL DP (1933), SERIAL NUMBERS 3,579,001 DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On right front door hinge pillar post.

ENGINE NUMBER:—Stamped on boss on left hand side of cylinder block between No. 1 and No. 2 cylinders.

ENGINE:—Six cylinder, 'L' head type, $3\frac{1}{8} \times 4\frac{3}{8}$ " bore and stroke, 201.31 cubic inch displacement, rated at 23.43 H.P., develops 75 H.P. at 3600 R.P.M. (standard compression Silver Dome head) or 81 H.P. at 3600 R.P.M. (Red Head engine). Standard compression ratio (Silver Dome engine) 5.5-1. High compression ratio (Red Head engine) 6.5-1.

BATTERY:—Willard, Type WS-1-13, 6 volt, 13 plate, 86 ampere hour capacity (20 hour rate). Starting capacity 106 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to transmission cover plate screw.

Mounting:—Mounted in cradle under driver's seat.

Dimensions:—Width, $7\frac{1}{16}$ ". Length, $9\frac{1}{16}$ ". Height, $8\frac{13}{16}$ ".

IGNITION:—Coil Model 537-V. Mounted on engine side of dash and connected to ignition switch by armored cable.

Ignition Current:—5-1.5 amperes at 6 volts (engine running), 4-5 amperes at 6 volts (engine stopped).

Ignition Switch:—Unit with coil. Switch mounted on instrument panel and connected to coil by means of armored cable protecting primary lead.

Distributor Model 622-H (first cars), 644-K (later cars). Single breaker, 6 lobe cam, full automatic advance type. Condenser mounted on outside of distributor. Breaker contacts adjusted by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw.

Breaker Gap:—Set at .020 inch. Hold within limits of .018-.024 inch.

Breaker Arm Spring Tension:—19-23 ounces (measured at a point directly behind contacts with spring scale at right angles to back of contact arm).

Automatic Advance—Model 622-H

Engine	Degrees	Distributor	R.P.M.	Distributor	Engine
2	Start	400	800		
17.5	8.75	1100	2200		
18	9	1200	2400		

Automatic Advance—Model 644-K

Engine	Degrees	Distributor	R.P.M.	Distributor	Engine
4	Start	250	500		
15	7.5	400	800		
32	16	1200	2400		

Mounting:—Distributor mounted at center left of engine and driven by inclined shaft from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance plate, lift out.

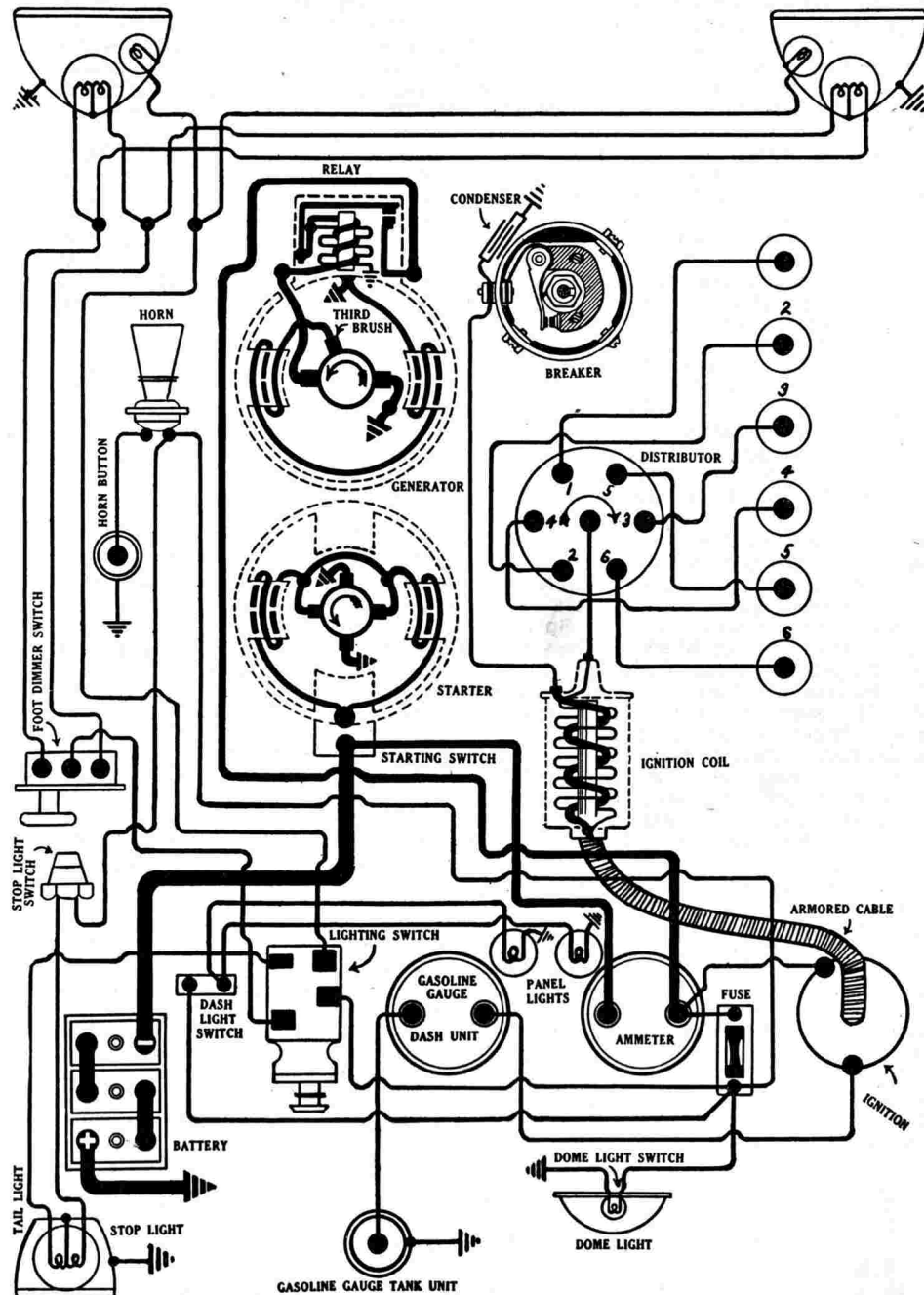
Oiling:—500 Miles. Turn down grease cup on side of shaft housing one turn. Keep cup filled with medium cup grease.

2000 Miles. Take off distributor cap and rotor, put 4-5 drops light engine oil in wick oiler in center of shaft, oil breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard settings for all engines as follows:

Engine	Distributor	Flywheel Degrees	Piston Travel
Low Compression	622-H	10° before TDC	.0423"
Low compression	644-K	3° after TDC	.0038"
High compression	622-H	7° before TDC	.021"
High compression	644-K	3° after TDC	.0038"

To Set Ignition Timing. First remove cover plate over inspection hole in left hand front face of flywheel housing directly below the starter. With No. 1 piston on compression stroke, turn engine over by hand until flywheel mark 'D/C' registers with ignition pointer (upper pointer when setting is before top dead center). Then loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.



DODGE SIX

MODEL DP (1933), SERIAL NUMBERS 3,579,001 DELCO-REMY SYSTEM

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—14 MM. Metric. A.C. Type K-12 (Standard Silver Dome engines), Type K-10 (High Compression Red Head engines). Set gaps at .025".

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine is driven by two-sprocket non-adjustable chain drive from the crankshaft. Sprockets are marked. To set timing, turn crankshaft so that pistons Nos. 1 and 6 are on top dead center. Mesh chain so that marks on sprockets are adjacent and in line with a straightedge laid across the shaft centers. Camshaft sprocket mounting cap screws are offset so that sprocket can only be assembled in correct position.

To Check Valve Timing. Remove 1/8 inch pipe plug in cylinder head over No. 6 piston and install Chrysler Timing Gauge. With No. 1 piston on top dead center entering power stroke, set tappet clearance of No. 1 intake valve at .011" and No. 1 exhaust valve at .012" (cold). Turn engine over one complete revolution and stop with piston .015" past top dead center as indicated on gauge. No. 1 intake valve should open at this point. Turn engine over 2° and stop when gauge reads .027". No. 1 exhaust valve should close at this point. Reset tappet clearance at .005" (intake), .007" (exhaust) with engine warm.

Valve Specifications

	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 15/32" (1 5/16" clear)	11/32"	45°	5/16"
Exhaust	1 15/32" (1 5/16" clear)	11/32"	45°	5/16"

Tappet Clearance

	Operating Timing	
Intake	.005" (hot) .011" (cold)	Closed—40-44 pounds—2 1/16"
Exhaust	.007" (hot) .012" (cold)	Compression Limit—1 3/4"

Valve Springs

	Intake Valves	Timing	Exhaust Valves
Open	—6° after top dead center.		Open 42° before lower dead center.
Close	—46° after lower dead center.		Close 8° after top dead center.

Valve Grinding:—Valve material Chrome Nickel Steel (intake), Silchrome Steel (exhaust). Special alloy exhaust valve seat inserts are used in the cylinder block. Valves should be refaced on valve grinder and then lapped in block. Ordinary reseating tool cannot be used on exhaust valve inserts and these must be ground when necessary. Install valves with .001-.003" stem clearance in guide (intake valves), .003-.005" (exhaust valves). Valve stem guides are removable.

CARBURETION:—Stromberg Downdraft Carburetor, Model EX-22. See Carburetor Section for complete data. Manifold heat control is automatic. Choke is manually controlled by button on instrument panel.

Air Cleaner:—Oil-wetted copper mesh type integral with silencer. Remove complete unit at 2000 mile intervals or oftener, take off top plate and felt pad, wash wire mesh by dipping in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical Fuel Pump mounted at right side of engine (see Equipment Section for complete data). At three-month intervals, remove sediment bowl under pump, empty water and sediment from bowl, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—Motometer Electric type (see Equipment Section for complete data).

STARTER:—Model 734-H. Starter drive—Overrunning clutch and manual pinion shift connected to starting switch pedal. Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces each.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5.0	65
12 "	Lock	3.63	475

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect cable and starting pedal linkage, take out flange mounting screws, pull starter forward to clear pinion housing, lift out.

Oiling:—5000 Miles. Put 8-10 drops light engine oil in commutator end oiler. Drive end bearing at outer end of pinion housing is oilless.

GENERATOR:—Model 943-S (Standard), 937-E (cars with radio). Third brush regulation, thermostat control (937-E only). Thermostat contacts open at 175°F. reducing charging rate approximately 40%. Rotation counter-clockwise at commutator end. Manufacturer recommends that charging rate be set at 8 amperes (943-S) or 10 amperes (937-E) maximum charge to battery as shown on dash ammeter with all lights on and engine operating at speed equivalent to 20 M.P.H.

Charging Rate Adjustment. Loosen small round lock screw on commutator end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data—Model 943-S

Standard Setting				Maximum Output			
Amperes		Volts		Amperes		Volts	
Cold		16-17		7.9-8.1		2000	
Hot		13-15		7.7-8.0		2400	

Generator Data—Model 937-E

Cold		20-22	8.2-8.4	2100	Cold		22-24	8.4-8.6	2400
Hot		12-14	7.7-8.0	2800-3000	Hot		12-14	7.7-8.0	2800-3000

Brush Spring Tension:—24-28 ounces on each brush.

Field Current:—3.5-4.5 amperes at 6 volts across field terminals.

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine and slip off drive belt, take out two bolts forming bracket hinge, lift generator out.

Belt Adjustment. To take up drive belt, loosen adjustment clamp bolt and mounting bolts, attach spring scale by wire looped over generator field frame so that force of spring is tangent to top of generator and parallel to slot in adjustment clamp. Pull generator away from engine until spring scale reading is 45-50 pounds and tighten adjustment clamp bolt and mounting bolts before slacking off on scale.

Oiling:—2000 Miles. Put 8-10 drops light engine oil in oiler at each end of generator (fill oilers once).

RELAY:—Model 265-G. Mounted on generator field frame. Contacts close when generator voltage reaches 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Lighting switch mounted on back of instrument board is controlled by button at left of instrument panel. Lighting system 'depressed beam' with double filament headlight bulbs controlled by foot-operated dimmer switch on toeboard. Stop and tail light equipped with double filament bulb (tail light lead must be connected to 2 cp. filament). Dimmer switch is Delco-Remy, 465-Z.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	32-21	D.C.	1116
Parking Bulbs	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Light	6-8	21-2	D.C.	1158
Dome Light	6-8	15	S.C.	87

FUSES:—20 ampere capacity fuse mounted on back of instrument board near ammeter.

HORNS:—Klaxon K-31, Type 1364. Vibrator type mounted at left of engine under the hood. Current draw 4.0-6.5 amperes at 6 volts. Model K-28, Type 1505- (low note), Type 1506 (high note) matched tone twin horns are optional. Current draw 6.0-8.5 amperes at 6 volts (Type 1505), 5.0-6.5 amperes at 6 volts (Type 1506).

DODGE EIGHT

MODEL DO (1933), SERIAL NUMBER 4,527,001 UP

DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On right front door hinge pillar post.

ENGINE NUMBER:—Stamped on boss on left hand side of cylinder block between No. 1 and No. 2 cylinders.

ENGINE:—Eight cylinder, 'L' head type, $3\frac{1}{4} \times 4\frac{1}{4}$ " bore and stroke, 282.1 cubic inch displacement, rated at 33.8 H.P., develops 100 H.P. at 3400 R.P.M. (standard Red Head Engine), or 92 H.P. at 3400 R.P.M. (optional Silver Dome Head engine). Standard compression ratio (Red Head engine) 6.2-1. Optional compression ratio (Silver Dome Head engine) 5.2-1.

BATTERY:—Willard, Type WS-4-17, 6 volt, 17 plate, 115 ampere hour capacity (20 hour rate). Starting capacity 140 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to left hand rear transmission cover plate screw.

Mounting:—In cradle under driver's seat.

Dimensions:—Width, $7\frac{1}{16}$ ". Length, $11\frac{11}{16}$ ". Height, $8\frac{13}{16}$ ".

IGNITION:—Coil Model 537-Y. Mounted on dash and connected to ignition switch by armored cable.

Ignition Current:—5-1.5 amperes at 6 volts (engine running), 4-5 amperes at 6 volts (engine stopped).

Ignition Switch:—Unit with coil. Switch mounted on instrument panel and connected to coil by means of armored cable (primary lead).

Distributor Model 661-D (first cars), 661-S (later cars). Single breaker arm, 8 lobe cam, full automatic advance type. No synchronization of contacts is necessary. Breaker gap adjusted by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw.

Breaker Gap:—Set at .018 inch. Hold within limits of .017-.022 inch.

Breaker Arm Spring Tension:—19-23 ounces measured at point directly behind contacts with spring scale at right angles to back of breaker arm.

Automatic Advance—Model 661-D

Engine	Degrees	Distributor	R.P.M.	Engine
2	Start	400	800	
17	$8\frac{1}{2}$	1100	2200	
Automatic Advance—Model 661-S				
2	Start	250	500	
15.2	7.6	420	840	
26	13	1100	2200	

Mounting:—Distributor mounted at left center of engine and driven by inclined shaft from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance plate, lift out.

Oiling:—500 Miles. Turn down grease cup on side of shaft housing one full turn. Keep cup filled with medium cup grease.

2000 Miles. Take off distributor cap and rotor, put 4-5 drops light engine oil in wick oiler in center of shaft, oil breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard settings for all engines as follows:

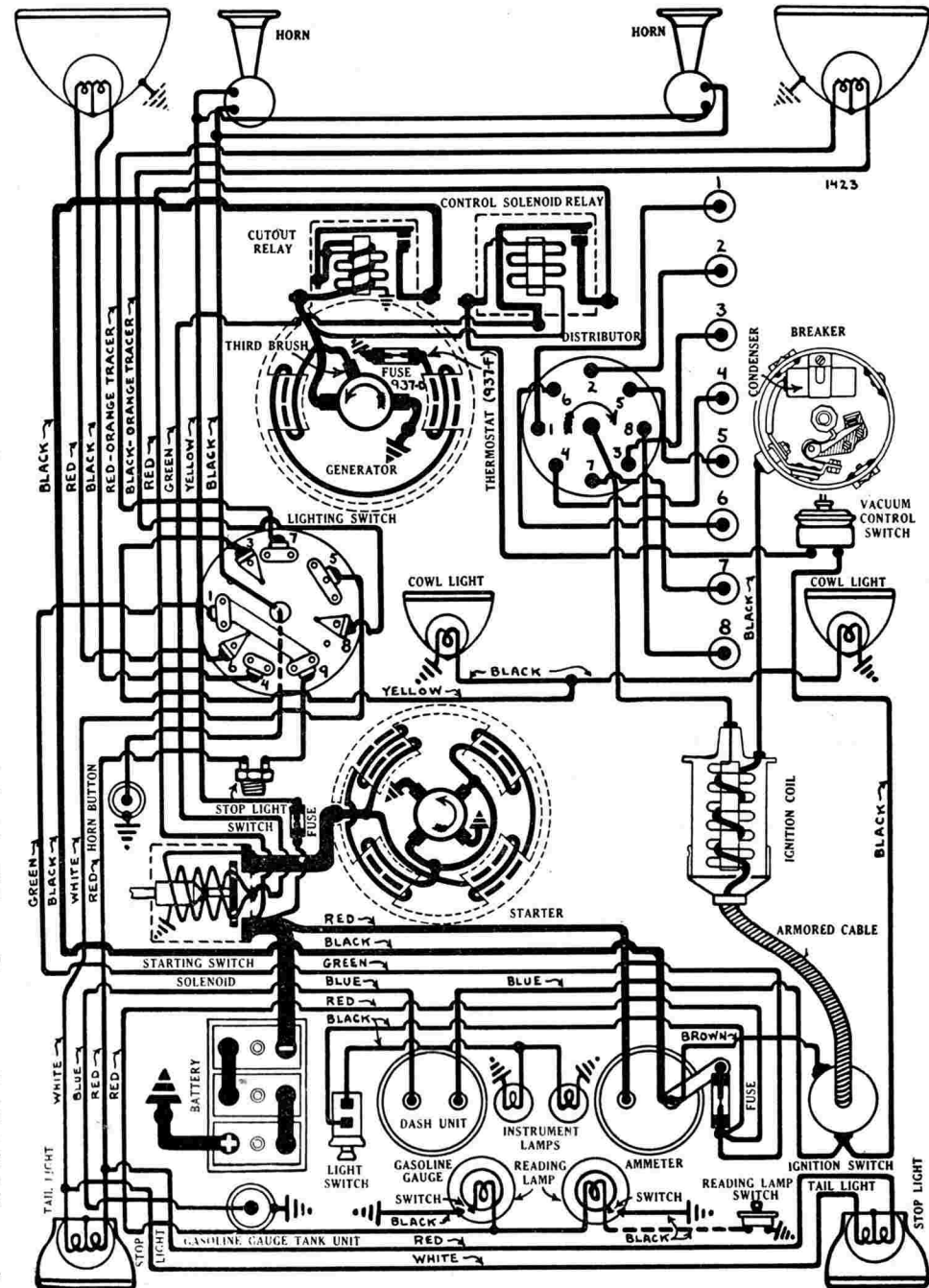
Engine	Distributor	Flywheel Degrees	Piston Travel
Low compression	661D	10° before TDC	.0400"
Low compression	661-S	At TDC	TDC.
High compression	661-D	7° before TDC	.0197"
High compression	661-S	4° after TDC	.0064"

To Set Ignition Timing. First remove cover plate over inspection hole in left hand front face of flywheel housing directly below starter. With No. 1 piston on compression stroke, turn engine over by hand until flywheel mark 'D/C' registers with ignition pointer (upper pointer when setting is before top dead center). Then loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—14 MM. Metric. A.C. Type K-10 (Standard Red Head Engine), Type K-12 (Silver Dome engines). Set spark plug gaps at .025 inch.

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is driven by two-sprocket non-adjustable chain drive from the crankshaft. Sprockets are marked. To set timing, turn crankshaft so that pistons Nos. 1 and 8 are on top dead center with flywheel mark 'D/C' opposite lower pointer in



DODGE EIGHT

MODEL DO (1933), SERIAL NUMBER 4,527,001 UP

DELCO-REMY SYSTEM

inspection hole. Mesh chain on sprockets so that marks are adjacent and in line with a straightedge laid across the shaft centers. Then mount camshaft sprocket on hub (mounting cap screw holes are offset so that sprocket can only be mounted in correct position).

To Check Valve Timing. Remove $\frac{1}{8}$ inch pipe plug in cylinder head over No. 8 piston and install regular Chrysler Timing Gauge. With No. 1 piston on top dead center entering power stroke, set tappet clearance of No. 1 valves at .011" (intake), .012" (exhaust) with engine cold. Turn engine over one complete revolution and stop with piston No. 8 slightly past top dead center when gauge reads .014". No. 1 intake valve should open at this point. Turn crankshaft 2° and stop when gauge reads .025". No. 1 exhaust valve should close at this point. Reset tappet clearance at .005" (intake), .007" (exhaust) with engine warm.

Valve Specifications

	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 15/32" (1 5/16" clear)	11/32"	45°	5/16"
Exhaust	1 13/32" (1 1/4" clear)	11/32"	45°	5/16"

Tappet Clearance

	Operating Timing	Closed
Intake	.005" (hot) .011" (cold)	40-44 pounds—2 1/16"
Exhaust	.007" (hot) .012" (cold)	Compression limit—1 3/4"

Valve Springs

	Intake Valves	Timing	Exhaust Valves
Open	6° after top dead center	Open—42° before lower dead center	
Close	46° after lower dead center	Close 8° after top dead center	

Valve Grinding:—Valve material chrome nickel steel (intake valves), sil-chrome steel (exhaust valves). Special alloy exhaust valve seat inserts are used in the cylinder block. Valves should be refaced in valve grinder and then lapped in the block. Ordinary reseating tool cannot be used on exhaust valve inserts and these must be ground when necessary. Install valves with .001-.003" stem clearance in guides (intake valves), .003-.005" (exhaust valves). Valve stem guides are removable.

CARBURETION:—Carter Downdraft Carburetor, Model E8A. See Carburetor Section for complete data. Manifold heat control is automatic. Choke is manually controlled by button on instrument panel.

Air Cleaner:—Oil-wetted copper mesh type integral with silencer. Remove complete unit at 2000 mile intervals or oftener, clean by dipping wire mesh end of unit in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical Fuel Pump mounted at right hand forward end of engine (see Equipment Section for complete data). At three month intervals, remove glass sediment bowl under pump, empty water and sediment from bowl, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—Motometer Electric type (see Equipment Section for complete data).

STARTER:—Model 725-Z (727-B on R.H.D. cars). Starter drive, overrunning clutch and mechanical pinion shift operated by solenoid mounted on starter field frame. Solenoid is controlled automatically by vacuum switch Model 1585 and relay solenoid in cut-out relay case on generator (see "Starter Controls" in Equipment Section for complete data on this equipment). Starter rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces on each brush.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5.0	60
15 "	Lock	3.0	600

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect all wires on solenoid, take out flange mounting cap screws, pull starter forward to clear pinion housing, lift out.

Oiling:—5000 Miles. Put 8-10 drops light engine oil in commutator end oiler. Drive end bearing at outer end of pinion housing is oilless.

GENERATOR:—Model 937-D (Standard), 937-F (cars with radio). Third brush regulation, thermostat control (937-F only). Thermostat contacts open at

175°F. reducing the charging rate approximately 40%. Rotation counter-clockwise at commutator end. Manufacturer recommends that charging rate be set at 8 amperes (937-D) or 10 amperes (937-F) maximum charge to battery as shown on dash ammeter with all lights on and engine operating at speed equivalent to 20 M.P.H.

Charging Rate Adjustment. Loosen small round lock screw on commutator end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data—Model 937-D

Standard Setting				Maximum Output			
	Amperes	Volts	R.P.M.		Amperes	Volts	R.P.M.
Cold	16-17	7.9-8.1	2000	Cold	19-21	8.1-8.3	2300
Hot	13-15	7.7-8.0	2400	Hot	13-15	7.7-8.0	2400

Generator Data—Model 937-F

Generator Data—Model 337-F							
Cold	20-22	8.2-8.4	2100	Cold	22-24	8.4-8.6	2400
Hot	12-14	7.7-8.0	2800-3000	Hot	12-14	7.7-8.0	2800-3000

Brush Spring Tension:—24-28 ounces on each brush.

Field Fuse:—6 ampere capacity.

Field Current:—3.4-4.5 amperes at 6 volts across field terminals.

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect all leads, take out adjustment clamp bolt, swing generator toward engine and slip off drive belt, take out two bolts forming bracket hinge, lift generator out.

Belt Adjustment. Attach spring scale by wire looped over generator field frame so that force of spring will be tangent to top of generator and parallel to slot in adjustment clamp. Loosen adjustment clamp bolt and mounting bolts, pull generator away from engine until spring scale reading is 45-50 pounds, tighten adjustment clamp bolt and mounting bolts before slacking off on scale.

Oiling:—2000 Miles. Put 8-10 drops light engine oil in oiler at each end of generator (fill oilers once).

RELAY:—Mounted on generator field frame. Consists of cut-out relay and special relay solenoid for control of starter operating solenoid. See article on Starter Controls in Equipment Section for complete data on relay solenoid. Cut-out relay contacts close when generator voltage reaches 6.75-7.5 volts and open with discharge current of 0-2.5 amperes.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contact closed).

Relay Solenoid:—Contacts close 4.3-4.7 volts and will remain closed until battery voltage drops to 2.0 volts or less (when starter is cranking engine). Contacts open when difference in voltage between generator and battery becomes 2.0 volts or less. Contact gap limits .050-.055 inch. Air gap limits .007-.009 inch with contacts closed.

LIGHTING:—Clum Switch, Model 9454. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Lighting system uses standard double filament bulbs but switch has a special 'passing' position with depressed beam (upper filament) of left hand headlight and driving beam (lower filament) of right hand headlight lighted (see wiring diagram). Stop and tail light equipped with double filament bulb (tail light lead must be connected to 2 cp. filament).

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21	D.C.	1116
Parking Bulbs	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Light	6-8	21-2	D.C.	1158
Dome Light	6-8	15	S.C.	87

FUSES:—20 ampere capacity fuse mounted on back of instrument board near ammeter. Generator field fuse is 6 ampere capacity.

HORNS:—Klaxon Model K-18-C, Type 1263 (Standard), Model 26 Matched Set (optional equipment). Vibrator type horns are mounted under headlights. Current draw 5.5-6.5 amperes at 6 volts for each horn (Model K-18-C), 5.0-6.5 amperes at 6 volts (Model K-26, Type 1506—high note), 6.0-8.5 amperes at 6 volts (Model K-26, Type 1505—low note).

ESSEX TERRAPLANE

SIX CYLINDER MODEL K (1932-33), SERIAL NUMBERS 350,000 UP
SPECIAL SIX MODEL KU (1933), SERIAL NUMBERS 5001 UP
AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—On plate on dash under engine hood. First serial number 350,000 (1932), 364,125 (1933).

ENGINE NUMBER:—Stamped on left hand side center of engine block. First serial number 5000 (1932), 20,501 (1933).

ENGINE:—Six cylinder, 'L' head type, 2 15/16x4 3/4" bore and stroke, 193 cubic inch displacement, rated at 20.7 H.P., develops 70 H.P. at 3200 R.P.M. (standard compression head engine) or 80 H.P. at 3200 R.P.M. (optional high compression head engine). Standard compression ratio 5.8-1. Optional high compression ratio 7.1-1. Compression ratio of each engine is cast in upper surface of cylinder head casting.

BATTERY:—National, Type H3-13X, 6 volt, 13 plate, 86 ampere hour capacity (20 hour rate). Starting capacity 102 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—Battery is mounted under left rear seat.

Dimensions:—Width, 7 7/8". Length, 9 1/8". Height, 8 13/16".

IGNITION:—Coil Model IG-4308. Lock coil type with ignition switch in base.

Ignition Current:—1-3 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped).

Ignition Switch:—Switch in base of coil extends through instrument board at lower center of instrument panel. Gasoline gauge and tell-tale signal lights connected to terminal on coil are controlled by ignition switch.

Distributor Model IGB-4074A. Single breaker arm, 6-lobe cam, full automatic advance type. To adjust contact gap, loosen lock nut on stationary contact stud, turn up stud, tighten lock nut.

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.020".

Breaker Arm Spring Tension:—16-22 ounces measured at tip of breaker arm with spring scale centered on arm and at right angles to back of arm.

Engine	Degrees	Automatic Advance	Distributor R.P.M.	Engine
0.....	Start.....	400.....	800	
8.....	4.....	825.....	1650	
16.....	8.....	1250.....	2500	
24.....	12.....	1675.....	3350	
30.....	15.....	2000.....	4000	

Mounting:—Distributor mounted at right center of the crankcase and is driven from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance plate, lift out.

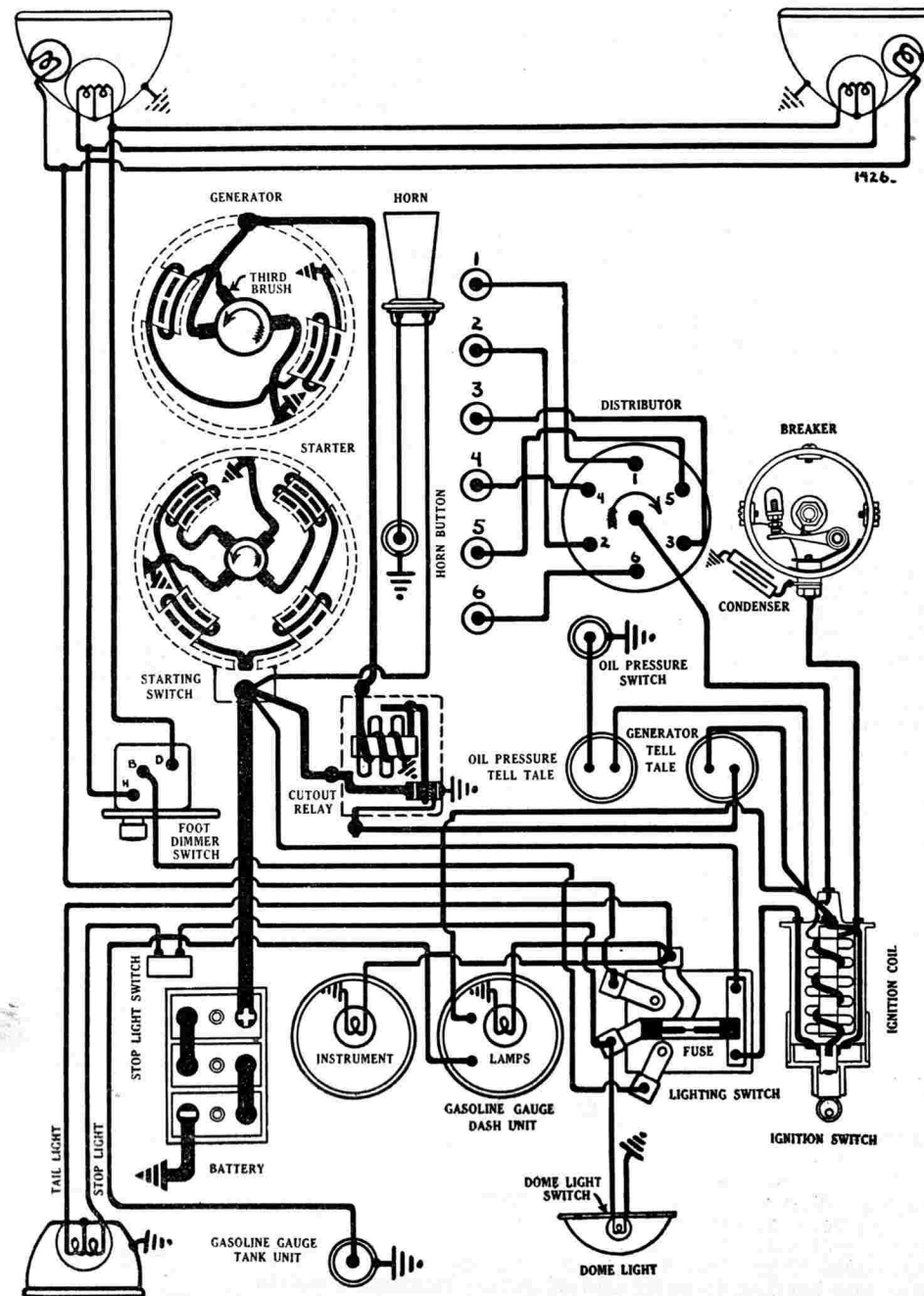
Oiling:—2000 Miles. Fill distributor base with light engine oil to level of oiler under distributor cup. Take off distributor cap and rotor, put one drop of oil on breaker arm pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Three distinct ignition settings are used, depending upon type of engine (compression ratio) and fuel characteristics:

1. Standard head—standard fuel:—Top dead center.
2. Standard head—Ethyl fuel:—3/4" (flywheel) or .0262" (piston travel) before top dead center.
3. High compression head—Ethyl fuel:—Top dead center.

To Set Ignition Timing. Loosen hold-down screw in advance plate, rotate distributor clockwise to limit of advance plate slot, tighten hold-down screw. Turn engine over by means of a wrench on the hexagonal end of the starting motor shaft until piston No. 1 reaches top dead center on compression stroke with flywheel mark 'U.D.C.1-6/' at indicator in inspection hole in left hand front face of flywheel housing (mark should be 3/4 inch before pointer on standard compression engines using Ethyl fuel exclusively). Then loosen hold-down screw, rotate distributor cup until contacts begin to open, tighten hold-down screw, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.



ESSEX TERRAPLANE

SIX CYLINDER MODEL K (1932-33), SERIAL NUMBERS 350,000 UP
SPECIAL SIX MODEL KU (1933), SERIAL NUMBERS 5001 UP
AUTO-LITE SYSTEM

Spark Plugs:—14 MM. Metric. Champion Type J-7. Set gaps at .020-.025".

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine is gear driven from the crankshaft. Gears are marked. Mesh gears so that marks are adjacent and in line with straightedge laid across shaft centers.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 3/8"	5/16"	5 3/32"	45°	11/32"
Exhaust	1 3/8"	5/16"	5 3/32"	45°	11/32"

Tappet Clearance

	Valve Springs
Intake	.006" (hot). Closed 53 pounds.
Exhaust	.008" (hot).

CARBURETION:—Carter Downdraft Carburetor, Model 243-S (first cars), 267-S (later cars). See Carburetor Section for complete data. Manifold heat control is adjusted manually.

Fuel Pump:—A.C. Mechanical fuel pump mounted on right side of crankcase and driven by an eccentric on the camshaft (see Equipment Section for complete data).

Gasoline Gauge:—Motometer electric type (see Equipment Section for complete data).

STARTER:—Model MAJ-4031. Starter drive—Inboard Bendix. Starter switch is mounted on starter field frame and is operated through flexible cable control by button at the left of the instrument panel. Starter rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
.3 lb. ft.	2500	5.5	100
2.25 "	1450	5.0	200
4.6 "	960	4.5	300
7.3 "	575	4.0	400
10.3 "	225	3.5	500
12.6 "	Lock	3.0	575
19.0 "	Lock	4.0	805

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect starter switch control, disconnect cable, take out flange mounting bolts, pull straight forward to clear Bendix, lift out.

Oiling:—Starter bearings are oilless.

GENERATOR:—Model GAM-4503. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate 17 amperes (cold) at 8 volts reached at 2400 R.P.M. Signal light (generator tell-tale) used instead of dash ammeter.

Charging Rate Adjustment. Take off commutator cover band, shift third brush by prying on brush mounting stud counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction. For all charging rate adjustments an ammeter must be connected in the generator line at the relay.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	700	0	6.4	760
4	6.9	880	4	6.9	1040
7	7.0	1000	8	7.3	1400
10	7.2	1180	10	7.5	1600
14	7.8	1520	12.8	7.9	2550
17	8.0	2400	12.2	7.8	3200
15.2	7.9	3200			

Brush Spring Tension:—18-22 ounces on each brush.

Field Current:—4.08-4.52 amperes at 6.0 volts across field terminals.

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine and slip off drive belt, take out two bolts under generator forming bracket hinge, lift generator out.

Belt Adjustment. Loosen mounting bolts and adjustment clamp bolt, swing generator out or away from engine, tighten adjustment bolt before slacking off on generator, tighten mounting bolts. Belt tension should be just enough to drive fan and generator without slipping.

Oiling:—1000 Miles. Put 3-4 drops light engine oil in oiler at each end. Ball bearing at drive end is packed with grease when assembled. Plain bearing at commutator end is oiled by wick in oil well.

RELAY:—Model CBA-4002. Special type with auxiliary contacts and terminal for operation of generator charge tell-tale. Tell-tale contacts are closed with main contacts open, and open when main contacts close (as generator begins to charge battery). Relay contacts close when generator voltage reaches 7.0-8.0 volts with charging current of not more than 5 amperes and open with discharge current of .5-2.5 amperes.

Contact Gap:—.025-.035". **Air Gap:**—.010-.030" (contacts closed).

SIGNAL LIGHTS:—These consist of battery charge tell-tale and oil pressure tell-tale lights mounted on instrument panel instead of conventional ammeter and oil pressure gauge. Light bulbs are standard 6-8 volt, 3 cp. D.C. Mazda Number 64 and can be removed by turning light counter-clockwise slightly to release bayonet socket pin.

Battery Charge Tell-tale. Under ruby reflector on right center of instrument panel. Tell-tale should light when ignition is turned 'on' with car stopped and should continue to burn until generator begins to charge (when relay contacts close). If tell-tale light does not burn when ignition is turned on and at idling speeds, check bulb by grounding tell-tale terminal on relay (left hand terminal) to generator field frame. If tell-tale does not light, replace bulb. If lamp lights when terminal is grounded, check auxiliary contact spring, contacts, and ground strap. See that auxiliary contacts are closed with main contacts open. If tell-tale lamp lights when car is operated at speeds above idling speed, the generator or relay is defective.

Oil Pressure Tell-tale. Under ruby reflector on left center of instrument panel. Tell-tale should light when ignition is turned 'on' with car stopped but should go out when car is operated. Tell-tale should not light or flash at speeds above idling. If tell-tale does not light when ignition is turned on, check bulb by grounding terminal on oil pressure check valve or control switch (on right side of crankcase) to engine. If tell-tale does not light, replace bulb. If tell-tale does not flash at idling speeds, disassemble check valve and clean out by-pass hole behind plunger, see that terminal pin is straight and clean, and that plunger is free to move in housing.

LIGHTING:—Soreng-Manegold Switch, Model B-5670-A. Dimmer Switch Model C-2100-A. Lighting switch mounted on back of instrument board and controlled by push-pull button at lower left center of instrument panel. Headlights equipped with double filament bulbs for 'depressed beam' dimming controlled by foot-operated switch on toeboard. Parking bulbs (in headlights) or fender lights are standard equipment. Stop and tail light fitted with double filament bulb.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	21-21	D.C.	1110
Parking or Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tell-tale Lights	6-8	3	D.C.	64
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome Lights	6-8	15	S.C.	87

ESSEX TERRAPLANE

EIGHT CYLINDER MODEL K-T (1933), SERIAL NUMBERS 65,001 UP AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—Stamped on plate on dash under engine hood. First serial number 65,001.

ENGINE NUMBER:—Stamped on left hand side at center of engine block. First serial number 15,001.

ENGINE:—Eight cylinder, 'L' head type, 2 15/16x4 1/2" bore and stroke, 244 cubic inch displacement, rated at 27.6 H.P., develops 94 H.P. at 3600 R.P.M. Standard compression ratio 5.8-1. No optional high compression ratio is offered. Special ignition setting is used for standard engine when operated with Ethyl fuel exclusively (see Ignition Timing).

BATTERY:—Exide, Type 3-VXA-15, 6 volt, 15 plate, 100 ampere hour capacity (20 hour rate). Starting capacity 114 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—Battery mounted under left rear seat.

Dimensions:—Width, 7". Length, 10 9/32". Height, 9 7/32".

IGNITION:—Coil Model CE-4303. Lock coil type with ignition switch in base. Mounted on back of instrument board.

Ignition Current:—2 amperes at 6 volts (engine running), 5 amperes at 6 volts (engine stopped).

Ignition Switch:—Switch in base of coil extends through instrument board to lower center of instrument panel. Gasoline gauge and tell-tale signal lights connected to accessory terminal of coil are controlled by switch.

Distributor Model IGH-4024A. Two-breaker arm, 4-lobe cam, full automatic advance type. Contacts open alternately at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Timing). To adjust contact gap, loosen two lock screws and turn eccentric adjusting screw on stationary contact mounting plate (first or 'fixed' set of contacts), loosen lock nut on stationary contact mounting stud and turn up stud (second or 'movable' set of contacts).

Breaker Gap:—Set contact gap at .020". Hold within limits of .020-.022".

Breaker Arm Spring Tension:—16-22 ounces measured at tip of breaker arm with spring scale at right angles to back of arm and centered on arm.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0.....	Start.....	400.....	800		
8.....	4.....	765.....	1530		
16.....	8.....	1130.....	2260		
24.....	12.....	1500.....	3000		
32.....	16.....	1865.....	3730		
35.....	17 1/2.....	2000.....	4000		

Mounting:—Distributor mounted at right center of engine crankcase and is driven from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance plate, lift out.

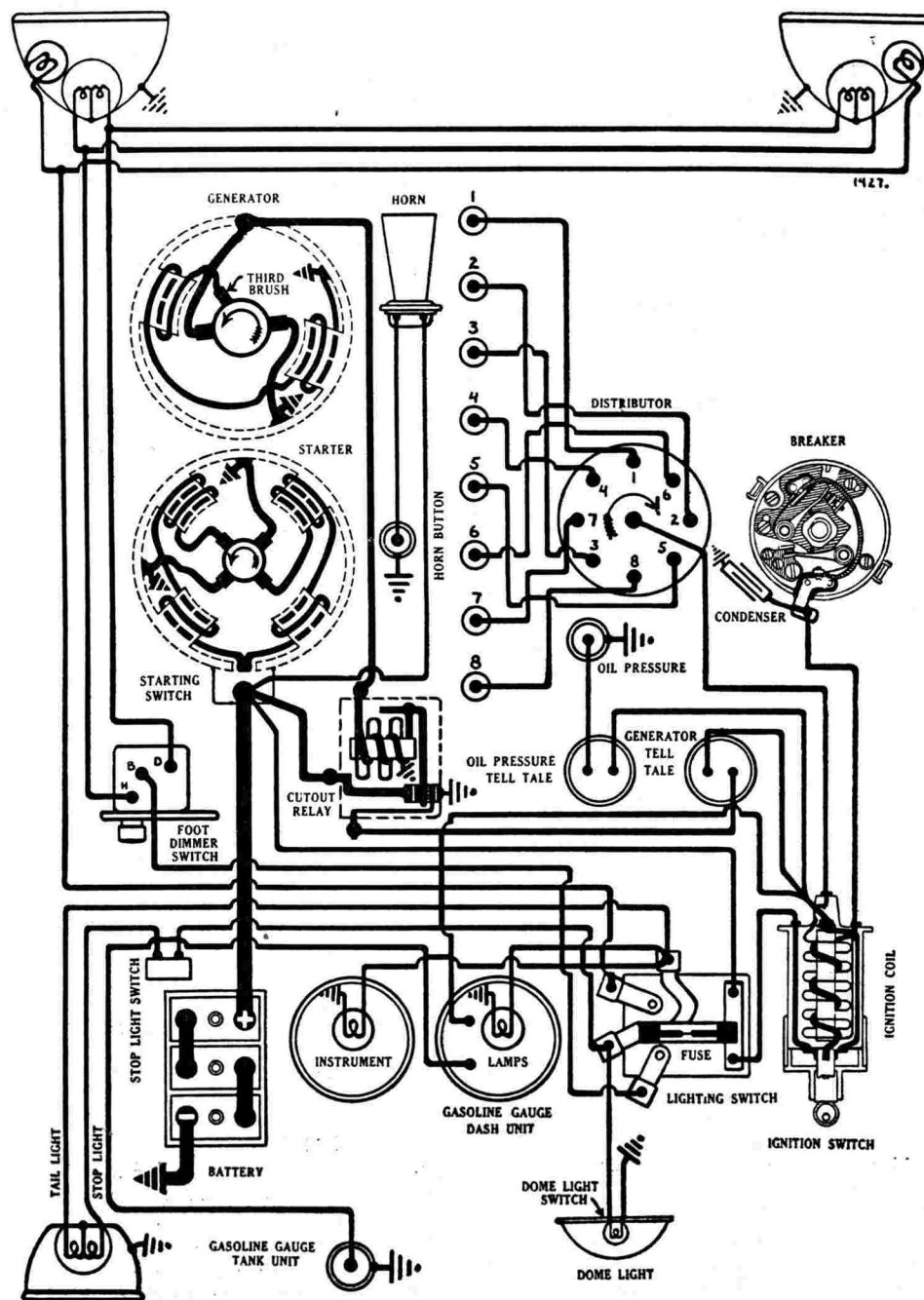
Oiling:—2000 Miles. Fill distributor base to level of oiler under distributor cup with light engine oil. Take off distributor cap and rotor, put one drop of oil on breaker arm pivot pins, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Two distinct ignition settings are used, depending upon type of fuel used in engine:

1. Standard fuel—Top dead center.

2. Ethyl fuel—1 1/4" (flywheel), or .0625" (piston travel) before top dead center.

To Set Ignition Timing:—Loosen hold-down screw in advance plate, rotate distributor clockwise to full extent of advance plate slot, tighten hold-down screw. With No. 1 piston on compression, turn engine over by means of a wrench on the hexagonal end of the starting motor shaft until piston reaches top dead center (or 1 1/4 inch before for Ethyl fuel) with the flywheel mark 'U.D.C.1-8' opposite the pointer (or 1 1/4" ahead) in the inspection hole in the left hand front face of the flywheel housing. Then loosen



ESSEX TERRAPLANE

EIGHT CYLINDER MODEL K-T (1933), SERIAL NUMBERS 65,001 UP

AUTO-LITE SYSTEM

hold-down screw in advance plate, rotate distributor counter-clockwise until first set (fixed contacts) begin to open, tighten hold-down screw, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated. Contacts must then be synchronized to time second (movable) set of contacts.

Synchronization of Contacts—first method. After first or fixed contacts have been timed to engine (above), turn engine over 90° or ¼ revolution to firing position of piston No. 6 with flywheel mark 'U.D.C.3-6/' at indicator in inspection hole in flywheel housing (or 1¼ inch before indicator for Ethyl fuel). Then loosen lock screws on breaker sub-plate carrying second set of contacts, shift plate until contacts begin to open, tighten lock screws.

Synchronization of Contacts—second method. Use special Auto-Lite tool and follow complete directions in Equipment Section.

Final Performance Test. After setting ignition, car should be road tested for performance. With correct setting, a slight spark knock should be heard when car is accelerated in high gear from 10 to 25 M.P.H. on a level road with wide open throttle. If knock is too pronounced, loosen hold-down screw in advance plate and retard setting one-half division at a time on the scale (rotate distributor clockwise). If knock is not heard, advance setting by rotating distributor counter-clockwise one scale division. Repeat test and change setting until correct performance is secured.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—14 MM. Metric. Champion Type J-7. Set gaps at .020-.025".

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is gear driven from the crankshaft. Gears are marked. Mesh gears so that marks are adjacent and in line with straightedge across shaft centers.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1½"	5/16"	5 3/32"	45°	11/32"
Exhaust	1¾"	5/16"	5 3/32"	45°	11/32"

Tappet Clearance

		Closed	
Intake	.006" (hot).		53 pounds
Exhaust	.008" (hot).		

Valve Springs

CARBURETION:—Carter Downdraft Carburetor, Model 261-S (see Carburetor Section for complete data). Manifold heat control is adjustable manually.

Fuel Pump:—A.C. Mechanical fuel pump mounted on left hand side of crankcase and driven by an eccentric on the camshaft (see Equipment Section for complete data).

Gasoline Gauge:—Motometer electric type (see Equipment Section for complete data).

STARTER:—Model MAB-4051. Starter drive—Inboard Bendix. Starter switch is mounted on starter field frame and operated through flexible cable control by a button at extreme left of instrument panel. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4000	5.5	46
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	700	4.5	300
10.2 "	420	4.0	400
17.0 "	Lock	3.0	525
24.0 "	Lock	4.0	725

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect starter switch control, disconnect cable, take out flange mounting bolts, pull straight forward to clear Bendix, lift out.

clockwise at commutator end. Maximum charging rate 17 amperes (cold) at 8 volts reached at 2400 R.P.M. Signal light (generator tell-tale) used instead of dash ammeter.

Charging Rate Adjustment. Take off commutator cover band, shift third brush by prying on brush mounting stud counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction. For all charging rate adjustments an ammeter must be connected in the generator line at the relay.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	700	0	6.4	760
4	6.9	880	4	6.9	1040
7	7.0	1000	8	7.3	1400
10	7.2	1180	10	7.5	1600
14	7.8	1520	12.8	7.9	2550
17	8.0	2400	12.2	7.8	3200
15.2	7.9	3200			

Brush Spring Tension:—18-22 ounces on each brush.

Field Current:—4.08-4.52 amperes at 6.0 volts across field terminals.

Motoring:—4.94-5.46 amperes at 6.0 volts.

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine and slip off drive belt, take out two bolts under generator forming bracket hinge, lift generator out.

Belt Adjustment. Loosen mounting bolts and adjustment clamp bolt, swing generator out or away from engine, tighten adjustment bolt before slacking off on generator, tighten mounting bolts.

Oiling:—1000 Miles. Put 3-4 drops light engine oil in oiler at each end. Ball bearing at drive end is packed with grease when assembled. Plain bearing at commutator end is oiled by wick in oil well.

RELAY:—Model CBA-4002. Special type with auxiliary contacts and terminal for operation of generator charge tell-tale. Tell-tale contacts are closed with main contacts open, and open when main contacts close (as generator begins to charge battery). Relay contacts close when generator voltage reaches 7.0-8.0 volts with charging current of not more than 5 amperes and open with discharge current of 5-2.5 amperes.

Contact Gap:—.025-.035". **Air Gap:**—.010-.030" (contacts closed).

SIGNAL LIGHTS:—These consist of battery charge tell-tale and oil pressure tell-tale lights mounted on instrument panel instead of conventional ammeter and oil pressure gauge. Light bulbs are standard 6-8 volt, 3 cp. D.C. Mazda Number 64 and can be removed by turning light counter-clockwise slightly to release bayonet socket pin. For complete data see 'Signal Light' paragraph on Terraplane Six.

LIGHTING:—Soreng-Manegold Switch, Model B-5670-A. Dimmer Switch Model C-2100-A. Lighting switch mounted on back of instrument board and controlled by push-pull button at lower left center of instrument panel. Headlights equipped with double filament bulbs for 'depressed beam' dimming controlled by foot-operated switch on toeboard. Parking bulbs (in headlights) or fender lights are standard equipment. Stop and tail light fitted with double filament bulb.

	Lamp Sizes			
Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking or Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tell-tale Lights	6-8	3	D.C.	64
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome Lights	6-8	15	S.C.	87

FORD

FOUR CYLINDER COMMERCIAL CARS AND TRUCKS (1932-33) FORD-AUTO-LITE SYSTEM

setting for cars using standard gasoline) or 4 degrees to left (23 degree setting for cars using Ethyl gasoline), tighten adjustment screw. **Remove timing pin and replace in running position before attempting to operate car.**

Firing Order:—1-2-4-3. No. 1 cylinder nearest the radiator. See diagram for spark plug connections.

Spark Plugs:— $\frac{7}{8}$ -18 SAE. Champion Type 3X. Use Type C-4 for replacement. Set gaps at .030 inch. Hold within limits of .030-.035 inch.

VALVE TIMING:—Valves at right of engine. Camshaft gear driven from the crankshaft.

Valve Specifications

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Exhaust	1 $\frac{1}{2}$ "	5/16"	5.649-5.651" (O.A.L.)	45°	.287"
Intake	1 $\frac{1}{2}$ "	5/16"	5.649-5.651" (O.A.L.)	45°	.314"

Tappet Clearance

		Spring Pressure
Intake	.010-.013" (see note)	33 pounds
Exhaust	.020-.022" (see note)	2 15/16"

Timing

Intake valves open 8° before top dead center. Intake valves close 56° after lower dead center.

Exhaust valves open 56° before lower dead center. Exhaust valves close 8° after top dead center.

Note on Tappet Clearance. No tappet clearance adjustment is provided. Tappet clearance as given above represents limits in service. Valves should be replaced when tappet clearance becomes excessive. Valve stem guides are of the split type and are held in place by the valve spring. Guides can be removed after the spring retainer is taken out and the valve spring released.

CARBURETION:—Special Zenith Updraft Carburetor (see Carburetor Section for complete data). Choke and needle valve are controlled manually by button at lower edge of instrument board on right side.

Fuel Pump:—Ford mechanical type fuel pump mounted on right hand side of crankcase and driven by eccentric on camshaft (see Carburetor Section for complete data).

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section for complete data).

STARTER:—Ford Auto-Lite Type. Starter drives engine through Bendix drive. Rotation is counter-clockwise at commutator end. Brush spring tension 2 pounds. Starter cranks engine at 1150 R.P.M. drawing 200 amperes at 6 volts (starting).

Starter Data

Torque	R.P.M.	Volts	Amperes
4 lb. ft.	1000	4.85	225
8 "	540	4.15	360
12 "	220	3.60	475

Starter Switch:—Auto-Lite design. Switch is mounted at left of engine and is operated by button between pedals (passenger cars) or at left of steering column (trucks).

Mounting:—Starter flange mounted on forward face of flywheel housing at left of engine. To remove, disconnect cable, take out 3 flange mounting bolts, pull starter forward to clear Bendix, lift out.

Oiling:—Starter bearings oilless. They require no attention.

GENERATOR:—Ford Auto-Lite Type. Generator current regulation by third brush system. To adjust generator output, take off commutator cover band, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate. Third brush mounting plate held in position by friction. Rotation counter-clockwise at commutator end. Maximum output should be set at 10-12 amperes. With standard setting, maximum charging rate is 10 amperes at 7 volts reached at 2000 R.P.M. or 22 M.P.H.

Generator Data

Amperes	Volts	R.P.M.
5.2	6.4	800
10.7	6.9	1600
4.8	6.75	4000

Brush spring tension is 20 ounces. Field current draw is 6.3 amperes at 7 volts. Generator motoring draws 5.75 amperes at 7 volts.

Mounting:—Generator mounted on swinging bracket at left front of engine and driven by the fan belt. To remove generator, disconnect leads, loosen mounting bolt, swing generator toward engine, slip off drive belt, take out mounting bolt forming bracket hinge, lift generator out.

Belt Adjustment. To take up fan belt, loosen generator mounting bolt, swing generator away from engine until belt tension is just sufficient to drive generator and fan without slipping, tighten mounting bolt.

Oiling:—1000 Miles. Put few drops light engine oil in oiler at each end of the generator.

RELAY:—Ford Type. Mounted on generator field frame. Relay contacts close at 650 R.P.M. of generator or 7.5 M.P.H. with generator voltage of 7.5 volts and charging current of approximately 2 amperes and open at 6.5 M.P.H. or 550 R.P.M. of generator with discharge current of 2.5 amperes. Relay contact gap limits .015-.020 inch. Air gap limits .010-.015 inch (contacts closed).

LIGHTING:—Essex Wire Co. Switch. Lighting switch mounted at lower end of steering column controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	21	S.C.	1129
Dome Light (Commercial Cars)	6-8	15	S.C.	87

FUSES:—20 ampere capacity lighting fuse mounted on fuse block in back of instrument board under cowl (see diagram).

F O R D

MODEL V-8-112 (1933)

FORD GENERATING, STARTING SYSTEM FORD-MALLORY IGNITION

CAR SERIAL NUMBER:—Same as engine number.

ENGINE NUMBER:—Stamped on top of clutch housing on engine and on left hand frame side member in front of left hand dash bracket.

ENGINE:—Eight cylinder 90 degree 'V' type, 'L' head engine, 3 1/16x3 3/4" bore and stroke, 220 cubic inch displacement, rated at 30 H.P., develops 81 H.P. at 3800 R.P.M. Standard compression ratio 6.33-1. Engine equipped with aluminum cylinder head. Compression pressure with open throttle is 125 pounds at 500 R.P.M. and 138 pounds at 1800 R.P.M.

BATTERY:—Ford Type, 6 volt, 15 plate, 80 ampere hour capacity.

Grounded Terminal:—Positive (+) terminal grounded.

Mounting:—In cradle under front floor boards on left hand side.

IGNITION:—Mallory Ignition Coil, Ford Type No. 18-12024. Coil is mounted on top of ignition unit at front of engine. A resistance unit mounted on the back of the instrument board is connected in series with the ignition coil.

Ignition Switch:—Co-incidental ignition switch and steering post lock mounted on steering column at instrument panel.

Distributor:—Mallory Ford Type. Two-breaker, 8-lobe cam, full automatic advance type with Vacuum Brake control. Right hand set of contacts (viewed from front of engine) are used for timing, left hand set of contacts are used to load coil (this set closes first and opens first but spark does not occur until right hand set of contacts open). See Equipment Section for complete data on Mallory distributors.

Breaker Gap:—Contact gap set at .012-.014" (both sets). To set gap with ignition unit off engine or distributor caps removed, loosen lock screw on stationary contact mounting bracket, take out rubber plug in side of housing and turn up stationary contact stud.

Breaker Arm Spring Tension:—19-22 ounces. Breaker arm spring tension should be measured at contacts using special compression spring scale which can be inserted through contact adjustment opening. Press breaker arm toward cam and note scale reading at instant contacts open.

Vacuum Brake:—See article on Mallory distributors in Equipment Section for complete information. If engine 'pings' under load and quality of gasoline is satisfactory, vacuum brake spring tension should be increased slightly by loosening lock nut and turning up adjusting screw.

Automatic Advance—Normal Operating Conditions

Engine Degrees	Distributor	Distributor R.P.M.	Engine
0.....	Start.....	350.....	700
2.....	1.....	450.....	900
5.....	2 1/2.....	550.....	1100
10.....	5.....	850.....	1700
14.....	7.....	1100.....	2200
22.....	11.....	1550.....	3100

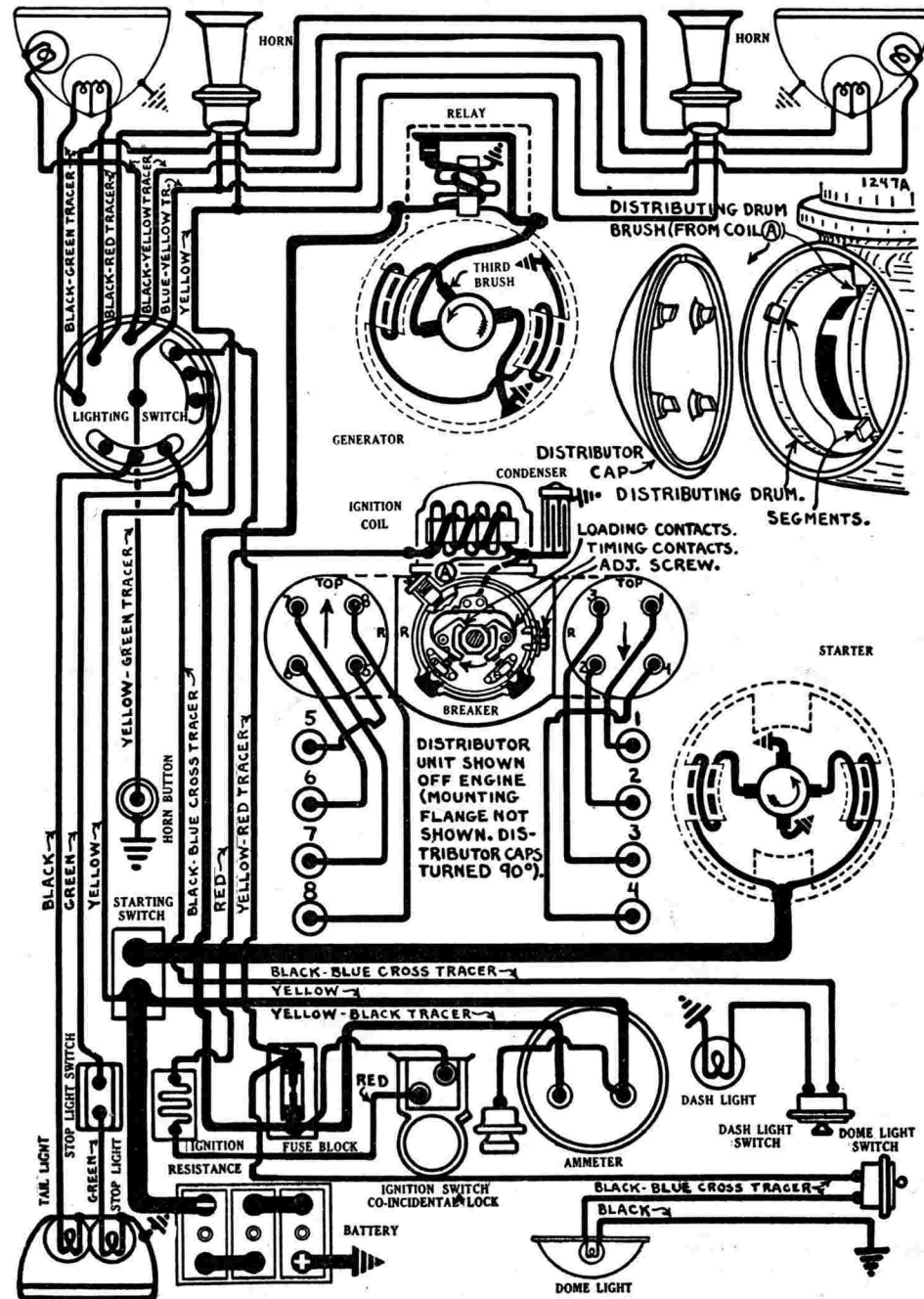
Automatic Advance—High Vacuum (brake inoperative)

0.....	Start.....	200.....	400
4.....	2.....	275.....	550
6.....	3.....	350.....	700
12.....	6.....	775.....	1550
16.....	8.....	1075.....	2150
22.....	11.....	1500.....	3000

Automatic Advance—No Vacuum (brake operative)

0.....	Start.....	475.....	850
3.....	1 1/2.....	500.....	1000
5.....	2 1/2.....	575.....	1150
10.....	5.....	975.....	1850
15.....	7 1/2.....	1300.....	2600
22.....	11.....	1800.....	3600

NOTE:—The new distributor unit with the exception of the automatic advance type, is shown in the distributor shaft assembly (40-19172) and is inter-



F O R D

MODEL V-8-112 (1933)

FORD GENERATING, STARTING SYSTEM

FORD-MALLORY IGNITION

changeable with the distributor used on the former V-8 model and will be supplied for service. The new distributor shaft is stamped '40' on the end of shaft beside the coupling tongue for identification. The advance weights are stamped '40' on the outside rim and can be checked by disassembling the vacuum brake and sighting through the piston cylinder.

Mounting:—Complete ignition unit mounted on front of engine on gear case cover. Driven directly through offset tongue-and-slot coupling from forward end of camshaft. To remove, disconnect primary lead, take off distributor caps (without disturbing cable connections), disconnect vacuum line, take out 3 cap screws, lift unit out.

Oiling:—1000 Miles. Light engine oil in oiler on front of distributor unit.

IGNITION TIMING:—Standard setting 4° before top dead center.

To Set Timing:—With No. 1 piston (front cylinder of right hand block) on top dead center of compression stroke, loosen the timing adjusting screw on the left hand side of the ignition unit, place the screw in the retarded position at the lower end of the slot and then move screw upward until contacts begin to open, note the position of the timing screw with reference to the graduations on the edge of the slot, move the screw up one additional graduation, tighten the adjusting screw. This will give the correct setting of 4° before top dead center. No flywheel marks are provided and the ignition should be set with the piston on dead center as directed above. This dead center position can be determined by a gauge rod placed in No. 1 cylinder or, with the head off, the distance below the top of the cylinder of No. 2 and No. 3 pistons can be measured. These distances will be exactly the same at dead center.

The timing screw slot is graduated in 4° intervals (crankshaft) and permits a maximum advance or retard of 10° on the crankshaft. The setting of individual engines can be varied in accordance with operating conditions and fuel characteristics.

Firing Order:—1-5-4-8-6-3-7-2 with cylinders numbered as indicated on diagram. This is 1R-1L-4R-4L-2L-3R-3L-2R with cylinder banks right (R) and left (L) as viewed from the driver's seat. No. 1 cylinder nearest the radiator.

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set plug gaps at .025".

VALVE TIMING:—Engine 'L' head type. Valves on inner side of cylinder block in 'valve alley' accessible after removing intake manifold. No tappet adjustment provided. Camshaft gear driven from crankshaft.

To Set Valve Timing. Camshaft gear and crankshaft gears are marked. Mesh gears so that the 'O' mark on the crankshaft gear is directly opposite the 'I' mark on the camshaft gear.

Valve Specifications

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1½"	5/16"	4¾" (O.A.L.)	45°	300"
Exhaust	1½"	5/16"	4¾" (O.A.L.)	45°	300"

Tappet Clearance

No adjustment provided or required

Intake Valves

Open—9½° before top dead center. Close—54½° after lower dead center.

Valve Timing

Open—57½° before lower dead center. Close—6½° after top dead center.

Valve Springs

40-42 pounds.

Exhaust Valves

Special Note:—Valve stem guides are split. They must be removed in order to take valves out of engine (because of lifter on end of valve stem). Guides can be removed after taking out spring retainer and releasing valve springs. Valve stems have a mushroom end which rests on the valve lifter bearing on the face of the cam. Valve tappet clearance should be held within limits of .0125-.0135 inch and valves should be replaced when clearance becomes excessive.

CARBURETION:—Detroit Lubricator Downdraft Carburetor (see Carburetor Section for complete data).

of engine. See Carburetor Section for complete data on this unit.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section for complete data).

STARTER:—Ford V8. Type. Starter drives through inboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 2 pounds. Starter cranks engine at 1070 R.P.M. drawing 200 amperes at 6 volts (starting).

Starter Data

Torque	R.P.M.	Volts	Amperes
4 lb. ft.	1070	4.6	200
8 " "	660	4.3	340
12 " "	300	3.65	465

Mounting:—Starter mounted on front of flywheel housing at right of engine. Bendix drive under cover at rear of housing. To remove starter, take out two bolts on starter end plate, pull starter out.

Oiling:—Starter bearings fitted with oilless bushings requiring no attention.

GENERATOR:—Auto-Lite Ford Type. Third brush regulation. Rotation is counter-clockwise at commutator end. With standard setting maximum charging rate is 10 amperes at 7 volts reached at 2000 R.P.M. or approximately 30 M.P.H.

Charging Rate Adjustment. Take off commutator cover band, shift third brush by prying on brush mounting stud counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction.

Generator Data

Amperes	Volts	R.P.M.
5.2	6.4	800
10.7	6.9	1600
4.8	6.75	4000

Brush Spring Tension:—20 ounces.

Field Current:—6.3 amperes at 7 volts.

Motoring:—5.75 amperes at 7 volts.

Mounting:—Generator mounted on bracket on top of cylinder block at front of engine and belt driven from crankshaft in tandem with two water pumps. Fan mounted on end of generator shaft. To remove generator, disconnect lead, take off nut on mounting stud in generator mounting bracket, lower generator and slip off drive belt, lift unit out.

Belt Adjustment:—To take up fan belt, loosen nut on mounting stud under generator, lift generator up until sideplay on belt at a point midway between water pump and crankshaft pulley is 1", tighten mounting nut.

Oiling:—1000 Miles. Light oil in oiler at each end of generator. Commutator bearing oiled from wick oiler in oil well under bearing cap.

RELAY:—Ford Type. Mounted on generator field frame. Relay contacts close at 8.5 M.P.H. or 650 R.P.M. of generator when voltage reaches 7.5 volts and open at 7 M.P.H. or 550 R.P.M. of generator with discharge current of 2.5 amperes. Relay contact gap limits .015-.020 inch. Air gap limits .010-.015 inch (contacts closed).

LIGHTING:—Essex Wire Co. Switch, Ford V-8 Type. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs (in headlights)	6-8	3	S.C.	63
Cowl Lights (when used)	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	21	S.C.	1129
Dome Light (passenger cars)	6-8	3	S.C.	63

HORNS:—Vibrator type, Ford Part No. 40-13802A (Standard equipment), or 40-13801B and 40-13802B matched set (DeLuxe equipment).

FRANKLIN

SUPERCHARGED AIRMAN SERIES 16-B (1933)

DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—Stamped on plate on dash under hood.

ENGINE:—Six cylinder, 'T' or overhead valve type with individual air-cooled cylinders bolted to the crankcase. Bore and stroke $3\frac{1}{2} \times 4\frac{3}{4}$ inches, 274 cubic inch displacement, rated at 29.4 H.P., develops 100 H.P. at 3100 R.P.M. Standard compression ratio 5.12-1. Optional compression ratios are not offered.

BATTERY:—Willard, Type WSB-21D, 6 volt, 21 plate, 143 ampere hour capacity (20 hour rate). Starting capacity 175 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—In cradle on outside of right hand frame member under dust shield.

Dimensions:—Width, 5 $\frac{7}{16}$ ". Length, 20 $\frac{5}{16}$ ". Height, 8 $\frac{5}{8}$ ".

IGNITION:—Coil Model 532-C. Coil mounted on back of instrument board on left side.

Ignition Current:—1.7-2 amperes at 6 volts (engine running), 4 amperes at 6 volts (engine stopped).

Ignition Switch:—Clum Model 9193 lock switch mounted on instrument panel. It will be necessary to disconnect and tape wire on 'IGN' terminal of Startix case when ignition is turned on to check timing or whenever automatic cranking is not desired.

Distributor Model 644-E. Single breaker, 6-lobe cam, semi-automatic advance type. Manual spark advance is controlled by button on instrument panel. Pushing button in (toward instrument board) advances distributor 25° (engine).

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start	200	400		
31	15½	1200	2400		

Mounting:—Distributor mounted on right side of crankcase. To remove, disconnect primary lead, take off distributor cap and cable conduit, loosen advance arm clamp bolt, lift distributor out.

Oiling:—500 Miles. Turn down grease cup on side of shaft housing one half turn. Keep cup filled with heat resistant grease such as Socony B-R-X2.

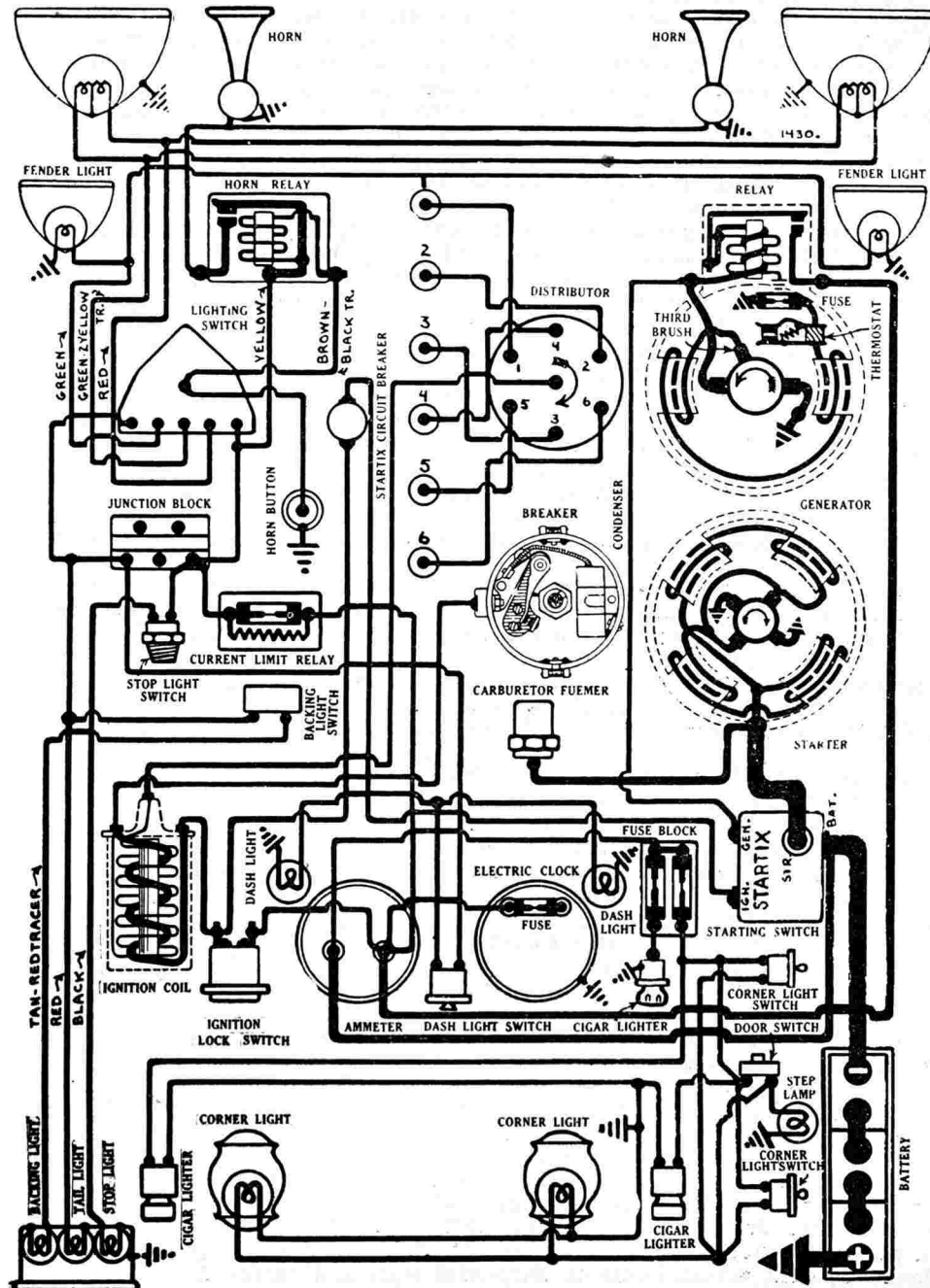
1000 Miles. Take off distributor cap and rotor. Fill wick oiler in center of shaft with light engine oil, put one drop on breaker arm pivot pin, apply thin film vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting 6° or 1" on fanwheel before top dead center with manual spark control advanced. To set timing, advance manual spark control button (push button in toward dash), see that distributor is rotated counter-clockwise to end of advance arm slot, take off inspection hole cover in fan wheel housing at right of engine. With No. 1 piston on compression turn engine over until '0' mark on fanwheel (which is top dead center mark) is exactly 1" before or to the right of the indicator line on the housing, loosen advance arm clamp screw, rotate distributor until contacts begin to open, tighten clamp screw, connect spark plugs as indicated on diagram.

Firing Order:—1-4-2-6-3-5. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set gaps at .025 inch.

VALVE TIMING:—Valves in cylinder head operated by rocker arm and pushrods at right of engine. Valve tappet adjustment at upper end of pushrods on rocker arm. Camshaft at right of engine. Driven by chain from crankshaft in tandem with generator drive sprocket. Chain adjusted manually by shifting generator (see Generator Mounting).



FRANKLIN

SUPERCHARGED AIRMAN SERIES 16-B (1933)

DELCO-REMY SYSTEM

To Check Valve Timing. Set tappet clearance No. 1 intake valve at .036" with No. 1 piston on top dead center entering power stroke. Place .005" feeler between rocker arm and valve stem to determine opening point, crank engine over one complete revolution and stop when tension on feeler indicates that valve is about to open (feeler will be gripped between rocker arm and valve stem). The '0' mark on the fanwheel should be between 3 3/16" and 4 3/16" past the reference line on the fanwheel housing in the inspection hole at the right of the engine.

To Set Valve Timing. Assemble camshaft sprocket on camshaft flange so that '0' marks on flange and sprocket line up. Turn camshaft and crankshaft so that '2' marks on sprockets line up and assemble chain.

Valve Specifications

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 27/32"	373"	5 9/32"	30°	5/16"
Exhaust	1 21/32"	373"	5 9/32"	30°	5/16"

Tappet Clearance

	Intake	Exhaust
.....	.007" (hot—engine idling)	.007" (hot—engine idling)

Spring Pressure

48-52 pounds (total both springs with valve closed)

Intake Valves

Open—28° after top dead center.
Close—50° after lower dead center.

Timing

Open—48° before lower dead center.
Close—4° before top dead center.

Exhaust Valves

CARBURETION:—Stromberg Updraft Carburetor, Model U-3 (see Carburetor Section for complete data). Manifold heat control is automatic. Carburetor is supercharged by the air intake being connected to the cooling air housing. Supercharging action is controlled manually by button on instrument panel (pulling out button cuts out supercharging action).

Air Cleaner:—Incorporated in supercharging mechanism.

Fuel Pump:—A.C. mechanical fuel pump mounted on left hand side of crankcase (see Equipment Section for complete data).

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model 723-C. Starter drives engine through reduction gears and an inboard Bendix drive. Starter gear reduction ratio 14 to 22. Rotation (armature shaft) clockwise at commutator end. Brush spring tension 24-28 ounces. Starter cranks engine at 175 R.P.M. drawing 135 amperes at 5 volts.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3500	5.0	70
2 "	2550	5.0	135
22 "	Lock	3.0	600

Starting Switch:—This model is equipped with Startix automatic starting switch. See Equipment Section for complete data on Startix and Startix Circuit Breaker. It will be necessary to disconnect wire on 'IGN' terminal of Startix case when ignition is turned on to check timing or whenever automatic cranking is not desired.

Mounting:—Starter flange mounted on right front face of flywheel housing. To remove, disconnect cable and fuemer lead, take out 3 flange mounting screws, pull starter forward to clear Bendix drive, lift out.

Oiling:—1000 Miles. Put 8-10 drops light machine oil in each of three starter bearing oilers.

Yearly. Remove plug in reduction gear case and repack gears with graphite grease.

GENERATOR:—Model 957-E. Third brush regulation, thermostat control. Thermostat contacts open at 190°F. reducing generator output approximately 40%. Rotation is counter-clockwise at commutator end. With standard setting, maximum charging rate is 18 amperes (cold) at 8.0 volts reached at 1800 R.P.M. or 27 M.P.H.

Charging Rate Adjustment. Loosen small round headed lock screw on end plate, take off commutator cover bard, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.4-8.6	1800	11-14	7.5-7.6	1900-2100

Brush Spring Tension:—14-18 ounces on each brush.

Field Current:—2.8-3.5 amperes at 6 volts across field terminals.

Field Fuse:—5 ampere capacity mounted in plug on commutator end plate.

Motoring:—Approximately 4-5 amperes at 6 volts.

Mounting:—Generator flange mounted on rear face timing chain case at right of engine. To remove, disconnect lead, take out two upper flange mounting screws, take off nut on rear end lower flange mounting bolt, pull generator to rear to disengage drive coupling, lift out. Generator sprocket mounted on journal between generator and chain case. Timing chain and camshaft setting will not be disturbed by removal of generator if nut on forward end of lower bolt is not loosened.

Chain Adjustment. To take up timing chain, loosen two upper flange mounting screws, loosen nut on forward end of lower flange mounting stud, turn adjustment set screw until play in chain between generator sprocket and camshaft sprocket is 3/8-1/2 inch (check by removing inspection plug in top of chain case and hooking wire under chain). Tighten mounting screws and stud nut. Chain should run noiselessly with proper adjustment. If chain hums, adjustment should be backed off slightly.

Oiling:—1000 Miles. Put 8-10 drops light machine oil in oiler on commutator end. Drive end bearing oiled from chain case.

RELAY:—Model 265-B. Relay mounted on generator. Relay contacts close at 680 R.P.M. of generator or 8-9 M.P.H. with generator voltage of 6.75-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

LIGHTING:—Delco-Remy Switch, Model 486-V. Lighting switch mounted at lower end of steering column controlled by lower lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop and Backing Lights	6-8	15	S.C.	87
Corner and Step Lights	6-8	3	S.C.	63

CURRENT LIMIT RELAY:—Mounted on dash. Consists of 20 ampere fuse connected across a fixed resistance. Fuse blows when current in line reaches 20 amperes, fixed resistance then limits current to 30 amperes.

FUSES:—Lighting fuse on Current Limit Relay 20 ampere capacity. Lighting fuses on fuse block on dash (body circuits) 30 ampere capacity. Generator field fuse 5 ampere capacity. Fuse on back of clock 5 ampere capacity.

HORNS:—Klaxon horns, Model K-18-C or K-14. Horns operated by horn relay. Horn current 6 amperes each.

Horn Relay, Model 266-T. Pressing of horn button completes horn relay circuit, energizes horn relay winding which closes horn relay contacts. Closing of horn relay contacts completes horn circuit. Horn current does not pass through horn button. Relay requires .25 amperes to close contacts. Horn relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch.

FRANKLIN

TWELVE CYLINDER MODEL 17-B (1933)

DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On plate on left hand side of dash under engine hood.
ENGINE NUMBER:—Stamped on left hand side of crankcase between Nos. 3 and 4 cylinders.

ENGINE:—Twelve cylinder 60-degree 'V', 'I' or overhead valve type, 3¼x4" bore and stroke, 398 cubic inch displacement, rated at 50.7 H.P., develops 150 H.P. at 3100 R.P.M. Standard compression ratio 5.1-1. Optional compression ratios are not offered.

BATTERY:—Willard, Type RH-5-19, 6 volt, 19 plate, 153 ampere hour capacity (20 hour rate). Starting capacity 180 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—In cradle on right frame member under front floor boards.

Dimensions:—Width, 7 1/16". Length, 13". Height, 9¾".

IGNITION:—Coil Model 532-C (2 used). Coils are mounted on the dash.

Ignition Current:—6 amperes at 6 volts (engine running), 10 amperes at 6 volts (engine stopped) total for both coils.

Ignition Switch:—Delco-Remy Model 427-Z.

Distributor Model 667-A. Two-breaker, 6-lobe cam, semi-automatic advance type. Breaker contacts open alternately at 30° intervals corresponding to 60° firing interval of engine. Contacts must be synchronized (see Timing). Manual advance is controlled by button on instrument board.

Manual Advance:—15 degrees (engine) maximum.

Breaker Gap:—Set contact gap at .022". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
2.0	Start	200	400		
14	7	800	1600		

Mounting:—Distributor mounted at rear of engine between cylinder banks. To remove, disconnect primary leads, disconnect manual spark control, take off distributor cap with cables intact, take out hold-down screw in advance arm, lift distributor out.

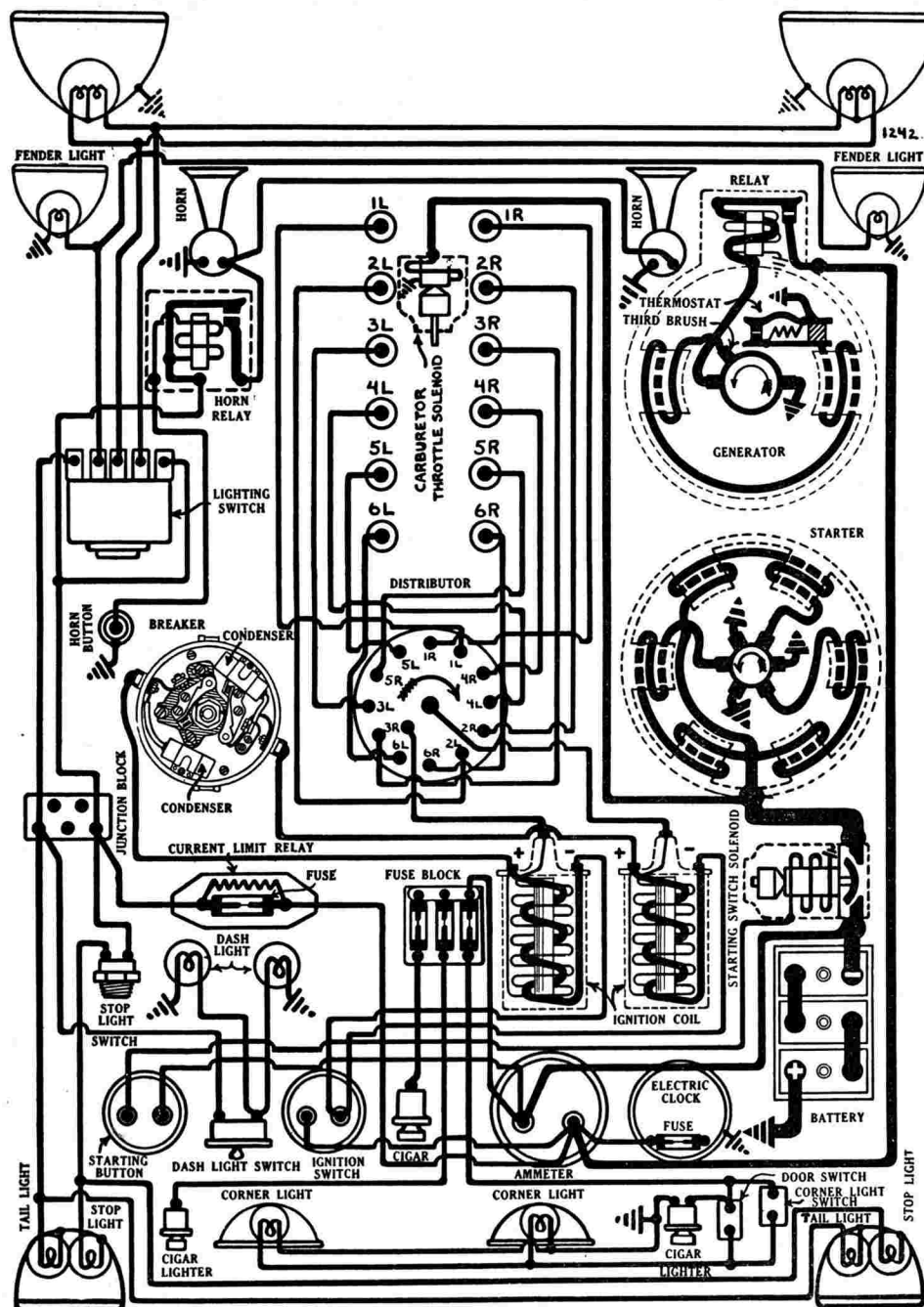
Oiling:—500 Miles. Turn down grease cup on side of shaft housing one half turn. Keep filled with heat resistant grease such as Socony B-R-X2.

1000 Miles. Take off distributor cap and rotor, fill wick oiler in center of shaft with light engine oil, put one drop oil on breaker arm pivot pins, apply thin film vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting ¾" (fanwheel) before top dead center with manual spark control advanced. To set timing, advance manual spark control, take off cover on inspection hole in fanwheel housing at front of engine. With No. 6 piston (left hand bank) on compression, turn engine over until second '0' mark on fanwheel is ¾ inch before the center line mark on the fanwheel housing. Loosen advance arm clamp bolt, rotate distributor cup until first set of contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt. Set timing for right hand bank of cylinders by synchronizing contacts.

Synchronization of Contacts—first method. After setting ignition for left hand cylinder bank (above) turn engine over two revolutions until No. 1 piston of the right bank enters compression stroke and stop with the first '0' mark on the fanwheel ¾ inch before the center line mark on the fanwheel housing. Then loosen lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten locking screws. Contacts will then be correctly synchronized.

Synchronization of Contacts—second method. Contacts can be synchronized on a rotary spark gap by adjusting movable plate until contacts open at 30 degree intervals. After synchronizing contacts, check contact gap. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.



FRANKLIN

TWELVE CYLINDER MODEL 17-B (1933)

DELCO-REMY SYSTEM

Firing Order:—1R-6L-4R-3L-2R-5L-6R-1L-3R-4L-5R-2L with cylinder banks right (R) and left (L) as viewed from the driver's seat and No. 1 cylinder nearest the radiator.

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set gaps at .025 inch.

VALVE TIMING:—**Camshaft Setting.** Valves in each cylinder block are operated by rocker arms on the cylinder head and pushrods on the outside of the block from an individual camshaft in the crankcase. Camshaft for left hand block is driven by chain from the crankshaft with an automatic idler take-up sprocket. Right hand block camshaft is chain driven from the crankshaft in tandem with the generator. Chain is adjusted manually (see Generator Mounting). To set timing with chain and sprockets removed from engine, mount sprockets so that '0' marks on camshaft flanges line up with '0' marks on sprockets and mesh chain so that '1' and '2' marks on crankshaft sprocket line up with the '1' or '2' marks on each sprocket.

To Check Valve Timing. Intake valves open with '0' mark on fanwheel $2\frac{1}{2}$ " past the indicator on the housing with .031" tappet clearance. To check timing, set tappet clearance intake valves No. 1 cylinder (right hand bank), No. 6 cylinder (left hand bank) at .031 inch, using a feeler gauge. Turn engine over one complete revolution past the firing position of No. 1R cylinder and stop with the first '0' mark on the fanwheel exactly $2\frac{1}{2}$ inches past the center line mark on the fanwheel housing. No. 1R intake valve should open at this point. Turn engine over 60 degrees and stop with sec-'0' mark on fanwheel exactly $2\frac{1}{2}$ inches past center mark on fanwheel housing. No. 6L intake valve should begin to open at this point. Set tappet clearance of all valves at .007 inch with engine hot and idling.

Valve Specifications

	Head Diameter	Stem Diameter	Stem Length	Valve Lift
Intake	1 $\frac{5}{8}$ "	.372"	6.555"	.120"
Exhaust	1 $\frac{51}{64}$ "	.372"	6.555"	.120"

Tappet Clearance

	Operating	Timing	Spring Pressure
Intake	.007" (hot)	.031" (cold)	48-52 pounds
Exhaust	.007" (hot)	.031" (cold)	

CARBURETION:—Stromberg Downdraft Dual Carburetor, Model EE-2 (see Carburetor Section for complete data). Manifold heat control and choke operated manually by buttons on instrument panel. Carburetor is super-charged by feeding air from the cylinder cooling duct. Super-charging action is controlled by button on instrument panel.

Carburetor Control:—Delco-Remy Solenoid No. 1370. This solenoid is set to open the carburetor throttle to one third of the full open position for starting. It is connected to the starter terminal and operates for as long as the starter is cranking the engine.

Fuel Pump:—A.C. mechanical type fuel pump mounted on left hand side of crankcase and operated by eccentric on left hand camshaft (see Equipment Section for complete data).

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model 545. Starter connected to engine through Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 36-40 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	5.0	70
19 "	Lock	3.0	500

Starter Switch:—Delco-Remy Operating Solenoid No. 120. Starting switch is of the electro-magnetic type and consists of an operating solenoid controlled by a push button switch on the instrument panel.

Mounting:—Starter mounted on forward face of flywheel housing at right of engine. To remove, disconnect cables, take out flange mounting screws, pull starter forward to clear Bendix, lift out.

Oiling:—Starter bearings are oilless. They require no attention.

GENERATOR:—Model 931-G. Third brush regulation, thermostat control. Thermostat contacts open at 190°F. reducing generator output approximately 40%. Rotation is counter-clockwise at commutator end. Maximum charging rate is 22-24 amperes at 8.6 volts (cold) reached at 1400 R.P.M. or 23-25 M.P.H.

Charging Rate Adjustment. Loosen small round lock screw on endplate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
22-24	8.6-9.0	1400	13.5-16.5	7.7-8.1	1700

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—3.5-4.0 amperes at 6 volts across field terminals.

Mounting:—Generator flange mounted on rear face of timing chain case at right of engine. To remove generator, disconnect lead, take out flange mounting screws at top and take off nut on rear end of lower mounting stud (do not disturb nut on forward end of stud). Pull generator to rear to disengage drive coupling, lift out.

Chain Adjustment. Check chain adjustment by taking out inspection plug in top of chain case at right of engine. Hook stiff wire under chain and measure sideplay at inspection hole. Adjust chain when sideplay exceeds $\frac{1}{2}$ ". To take up chain, loosen two upper generator mounting screws and nut on forward end of lower mounting stud. Back off adjustment screw lock nut and turn up on adjustment screw until sideplay on chain is $\frac{3}{8}$ - $\frac{1}{2}$ ". Tighten mounting screws, nut on mounting stud and adjusting screw lock nut.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler on commutator end. Drive end bearing oiled from chain case.

RELAY:—Model 265-B. Relay mounted on generator. Relay contacts close when generator voltage reaches 6.75-7.5 volts and open with 0-2.5 ampere discharge current. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

LIGHTING:—Delco-Remy Switch, Model 486-V. Lighting switch is mounted at lower end of steering column controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Corner Lights	6-8	3	S.C.	63

CURRENT LIMIT RELAY:—Mounted on dash. Consists of a fixed resistance connected across a 20 ampere fuse. Fuse blows when current in line reaches 20 amperes and fixed resistance then limits current to 30 amperes.

FUSES:—Lighting fuse on Current Limit Relay 20 ampere capacity. Lighting fuses on fuse block on dash (body circuits) 30 ampere capacity.

HORNS:—Klaxon Horn, Model K-18-C and K-14. Horns controlled by horn relay. Current draw approximately 6 amperes each.

Horn Relay:—Model 266-T. Horn relay circuit is controlled by horn button on steering wheel. Pressing horn button completes horn relay circuit, energizes relay solenoid, closes horn relay contacts. This completes horn circuit. Horn current does not pass through horn button. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch.

FRANKLIN

OLYMPIC SERIES 18 (1933), SERIAL NUMBERS 11001 UP

DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On plate on left hand side of dash under engine hood.

First number this series, 11001.

ENGINE NUMBER:—Stamped on left hand side of crankcase below No. 2 cylinder in back of the fuel pump. First number of this series, 5601.

ENGINE:—Six cylinder, 'I' or overhead valve type, with individual air-cooled cylinders bolted to crankcase, $3\frac{1}{2} \times 4\frac{3}{4}$ bore and stroke, 274 cubic inch displacement, rated at 29.4 H.P., develops 100 H.P. at 3100 R.P.M. Standard compression ratio, 5.12-1. No optional ratios are furnished.

BATTERY:—Willard, Type WH-1-13, 6 volt, 13 plate, 102 ampere hour capacity (20 hour rate). Starting capacity 120 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—In cradle under right hand front compartment floor boards.

Dimensions:—Width, 7 $\frac{1}{16}$ ". Length, 9 $\frac{1}{16}$ ". Height, 9 $\frac{5}{16}$ ".

IGNITION:—Coil Model 533-R. Coil mounted on dash above center of toeboard.

Ignition Current:—1.7 amperes at 6 volts (engine running), 4 amperes at 6 volts (engine stopped).

Ignition Switch:—Electrolock, Type 17-S (no armored cable). Switch has two on positions, both located to right of vertical 'off' position. With switch in first 'on' position, ignition is turned on but Startix is not operative. This position should be used in checking ignition when automatic cranking is not desired. The second 'on' position with key turned to extreme right is the regular running position of the switch with ignition and Startix operative.

Distributor Model 644-E. Single breaker arm, 6 lobe cam, semi-automatic advance type. Manual spark advance controlled by knob on instrument panel. Pulling out knob retards distributor for heavy pulling or hand cranking. Pushing in knob advances distributor 25 degrees (engine).

Breaker Gap:—Set gap at .020". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0.....		Start.....	200.....		400
31.....		15½.....	1200.....		2400

Mounting:—Distributor mounted at top right center of engine. To remove, take off distributor cap, disconnect primary lead, loosen advance arm clamp bolt, lift distributor out.

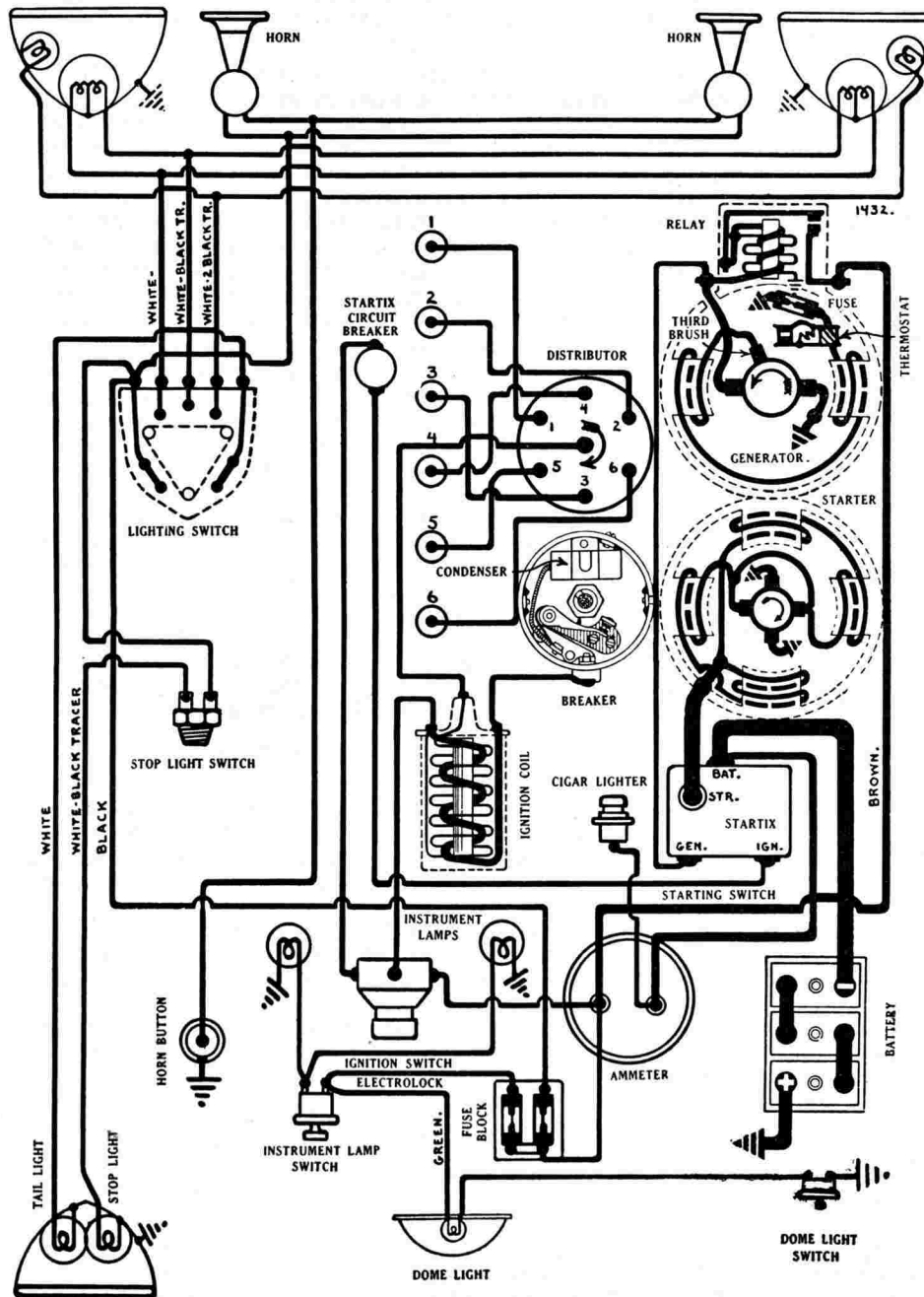
Oiling:—500 Miles. Turn down grease cup on side of shaft housing. Keep cup filled with special heat resistant grease such as Socony B-R-2X.

1000 Miles. Take off distributor cap and rotor, put 5-6 drops light engine oil in wick oiler in center of shaft, put one drop oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting 6° or 1" on fanwheel before top dead center with manual spark control advanced.

To Set Ignition Timing. First advance manual spark control (push knob in toward dash) and see that distributor is rotated counter-clockwise to extent of advance arm slot (lever must be forward against stop). Take off cover plate on right hand side of fanwheel housing, take off No. 6 cylinder walking beam case cover and felt pad so that closing of No. 6 exhaust valve can be noted. Turn engine over by hand until No. 6 exhaust valve just closes (No. 1 piston will be on compression stroke) and stop when '0' mark on fanwheel is one inch before or to the right of the reference mark on the inside of the fanwheel housing. Then loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite No. 1 segment in distributor cap. If ignition is turned 'on' to check contact opening, use first 'on' position of switch to avoid automatic cranking.

Firing Order:—1-4-2-6-3-5. No. 1 cylinder nearest radiator.



FRANKLIN

OLYMPIC SERIES 18 (1933), SERIAL NUMBERS 11001 UP DELCO-REMY SYSTEM

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set gaps at .025 inch.

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine is driven in tandem with generator by chain from the crankshaft. Chain is adjusted manually by shifting generator (see Generator Mounting). To set timing, assemble camshaft sprocket on camshaft flange so that '0' marks on sprocket and flange line up. Turn camshaft and crankshaft so that '2' marks on each sprocket line up and mesh chain (generator should be slacked off so that chain can be installed).

To Check Valve Timing:—With No. 1 piston on top dead center entering power stroke (both valves closed, '0' mark on fanwheel registering with reference line on fanwheel housing), set tappet clearance of No. 1 intake valve at .036" and insert .005" feeler to check valve action. Crank engine over almost one complete revolution and stop when tension on feeler indicates that valve is about to open (feeler will be gripped between rocker arm and valve stem). The '0' mark on the fanwheel should be 3 3/16-4 3/16 inches past the reference line on the fanwheel housing. If outside these limits, camshaft must be reset. Set tappet clearance at .007 inch with engine warmed up and idling.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 27/32"	.373"	5 9/32"	30°	5/16"
Exhaust	1 21/32"	.373"	5 9/32"	30°	5/16"

Tappet Clearance

Intake	.007" (hot—engine idling)	Closed—48-52 pounds (to just seat valves).
Exhaust	.007" (hot—engine idling)	

Valve Springs

Intake	.....007" (hot—engine idling)	Closed—48-52 pounds (to just
Exhaust	.....007" (hot—engine idling)	seat valves).
Intake Valves		Timing	
Open	.....28° after top dead center.	Exhaust Valves
Closed	50° after lower dead center	Open48° before lower dead center
		Closed4° before upper dead center.

Valve Grinding Note:—Cylinders must be removed from engine, valve mechanism taken off cylinder head, and cylinder head removed from cylinder (requires special tool) before valves can be ground. Special inserts are used for valve seats and spark plugs. Never attempt to remove valve seat inserts or spark plug bushings. Valves can be ground in the usual manner with cylinder head removed. In reassembling be sure that copper gasket between cylinder head and cylinder is in place, and coat gasket with Key Hot Joint Paste.

CARBURETION:—Stromberg Updraft Carburetor, Model U-3. See Carburetor Section for complete data. Manifold heat control is automatic. Carburetor is super-charged by air intake being connected to cooling air housing. Supercharging action controlled manually by knob on left of instrument panel. Pulling out knob cuts out supercharging action.

Fuel Pump:—A.C. Mechanical Fuel Pump mounted on left side of engine (see Equipment Section for complete data).

Gasoline Gauge:—K.S. Telegauge, hydrostatic type (see Equipment Section).

Air Cleaner:—Air Cleaner is incorporated in supercharging mechanism.

STARTER:—Model 723-C. Starter drive—through reduction gears and inboard Bendix drive with Startix automatic starting switch and Startix Circuit Breaker. See Equipment Section for complete data on Startix and Circuit Breaker. Gear reduction ratio, 14-22. Rotation of armature shaft clockwise at commutator end. Brush spring tension 24-28 ounces. Starter cranks engine at 175 R.P.M. drawing 135 amperes at 5 volts.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3500	5.0	70
22 "	Lock	3.0	600

Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, disconnect cable, take out 3 flange mounting screws, pull starter forward to clear Bendix, lift out.

Oiling:—1000 Miles. Put 8-10 drops medium engine oil in each of three oilers. **Yearly.** Remove plug in reduction gear case, repack gears with graphite grease.

GENERATOR:—Model 957-E. Third brush regulation with thermostat control. Thermostat contacts open at 190°F. reducing generator output 40%. Rotation is counter-clockwise at commutator end. With standard setting maximum charging rate (cold) is 19-21 amperes at 8.6 volts reached at 1800 R.P.M., or 27 M.P.H.

Charging Rate Adjustment. Loosen small round lock screw on commutator end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.4-8.6	1800	11-14	7.5-7.6	1900-2100

Brush Spring Tension:—14-18 ounces on each brush.

Field Fuse:—5 ampere capacity mounted in plug on commutator end plate.

Field Current:—2.8-3.5 amperes at 6 volts across field terminals.

Motoring:—4-5 amperes at 6 volts.

Mounting:—Flange mounted on right hand rear face of timing chain case and chain driven in tandem with camshaft. To remove, disconnect lead, take out two upper flange mounting screws, take off nut on rear end of lower flange mounting bolt, pull generator to rear to disengage drive coupling and lift out. Generator sprocket is mounted on a journal between generator and chain case and will not be disturbed by removal of generator if nut on forward end of lower bolt is not disturbed.

Chain Adjustment:—To adjust chain, loosen two upper generator flange mounting screws, loosen nut on forward end of lower mounting bolt, back off lock nut on adjustment set screw, and take out inspection plug in top of chain case. Then turn up adjustment screw until up-and-down play of chain midway between generator and camshaft sprockets is 3/8-1/2 inch (check by hooking a stiff wire under chain through the inspection hole and working wire up and down). Tighten mounting screws and lower stud nut. Chain should run noiselessly with correct adjustment. If chain hums, adjustment should be backed off slightly.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler on commutator end. Drive end bearing is oiled from the chain case.

RELAY:—Model 265-B. Mounted on generator field frame. Contacts close at 680 R.P.M. with generator voltage of 6.75-7.5 volts and open with discharge current of 0-2.5 amperes.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Delco-Remy Switch, Model 486-V. Lighting switch mounted at lower end of steering column, controlled by lever on steering wheel. Lighting system 'depressed beam' with double filament headlight bulbs controlled by lighting switch.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	3	S.C.	63

FUSES:—Two 20-ampere capacity fuses mounted on fuse block on back of instrument board. Generator field fuse mounted in plug on end plate is 5 amperes capacity.

HORNS:—Klaxon, Model K-26, Type 1507 (low note), 1508 (high note), vibrator type twin horns.

FRONTENAC

MODEL 6-70 (1932), SERIAL NUMBERS 1302 UP MODEL 6-85 (1932), SERIAL NUMBERS K-1001 UP AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—Located on plate on front of dash at right (6-70), or on right hand side upper toeboard (6-85).

ENGINE NUMBER:—Stamped on right hand upper front corner of engine block under the manifold.

ENGINE:—(Model 6-70). Continental Model 22-A, 6 cylinder, 'L' head type, 3¼x4" bore and stroke, 199.1 cubic inch displacement, rated at 25.4 H.P., develops 71 H.P. at 3100 R.P.M. Standard compression ratio 5.32-1.

ENGINE:—(6-85). Model 32-A, 6 cylinder, 'L' head type engine, 3¾x4" bore and stroke, 214.7 cubic inch displacement, rated at 27.3 H.P., develops 70 H.P. at 3400 R.P.M. Standard compression ratio 5.4-1.

BATTERY:—Prest-O-Lite, Type 613-SHA, 6 volt, 13 plate, 114 ampere hour (5 ampere rate. Starting capacity 145.5 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame side rail.

Mounting:—In cradle on left hand frame side rail under driver's seat.

IGNITION:—Coil Model IG-4302 (6-70), IG-4303 (6-85). Lock coil switch type mounted on back of instrument board with switch projecting through to face of instrument panel.

Ignition Current:—1-3 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped).

Ignition Switch:—Chicago Lock (6-70), Yale & Towne Lock (6-85) assembled as unit with coil.

Distributor Model IGB-4031-H, A. Single breaker, 6 lobe cam, semi-automatic advance type. Maximum manual advance 20 degrees (engine). To set breaker gap, loosen lock nut on stationary contact stud, turn up stud, tighten lock nut.

Contact Gap:—Set at .020 inch. Hold within limits of .018-.020 inch.

Breaker Arm Spring Tension:—16-20 ounces measured at tip of breaker arm with spring scale centered on arm and at right angles to back of arm.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0.....	Start.....	300.....	600		
4.....	2.....	590.....	1180		
8.....	4.....	880.....	1760		
12.....	6.....	1180.....	2360		
15.....	7½.....	1400.....	2800		

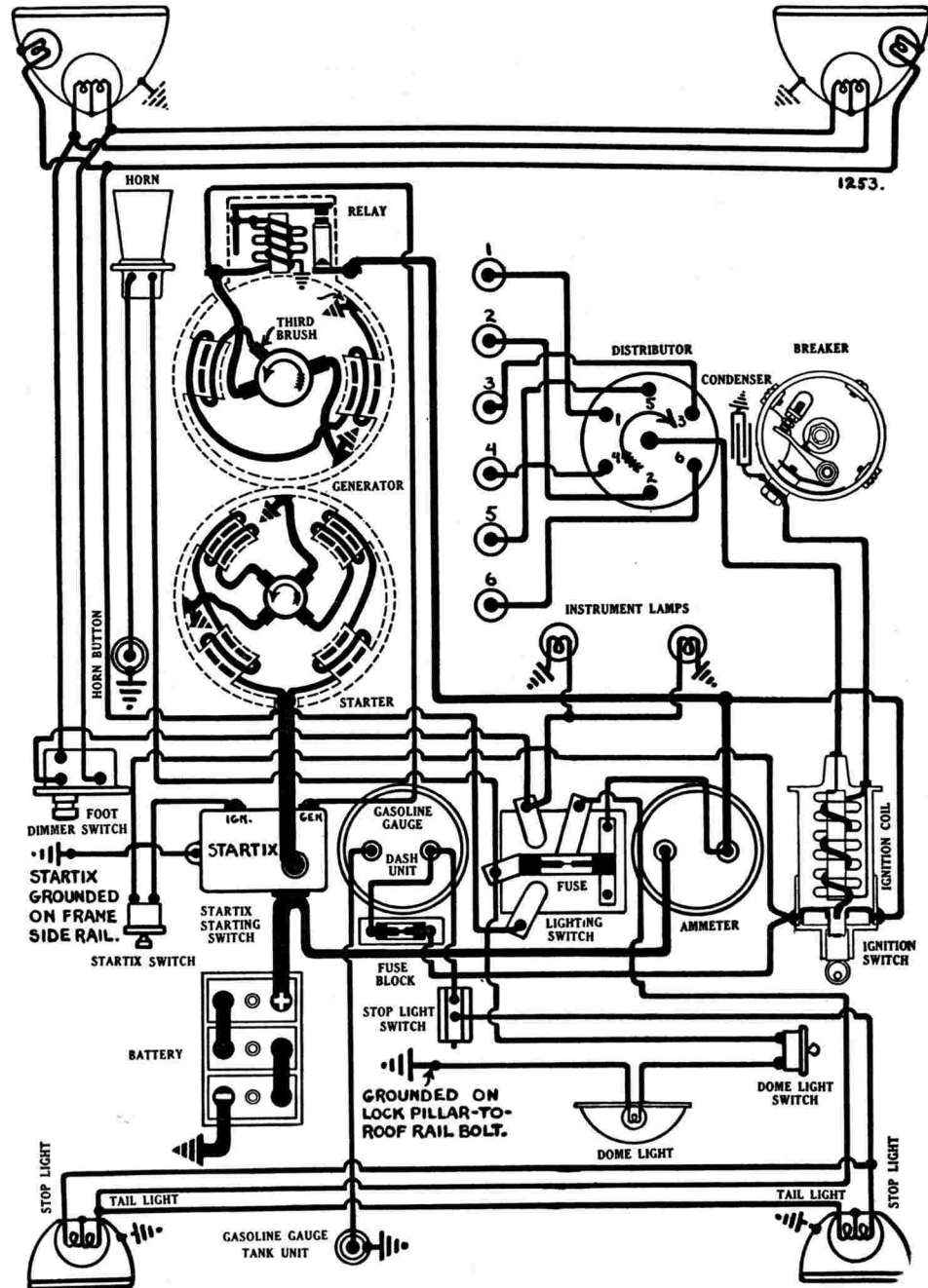
Mounting:—Distributor mounted on cylinder head and driven from camshaft. To remove, disconnect primary lead and manual spark control, take off distributor cap, take off nut on hold-down stud in advance arm or loosen advance arm clamp bolt, lift distributor out.

Oiling:—500 Miles. Put 4-5 drops light oil in oiler on side of housing.

1000 Miles. Take off distributor cap and rotor, put one drop oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

Timing:—Standard setting, 6° or two teeth (flywheel) or .0136" (piston travel) before top dead center with manual spark control advanced.

To Set Ignition Timing:—First advance manual spark control, see that distributor is rotated counter-clockwise to limit of advance arm slot, open 'Startix' auxiliary switch to prevent automatic cranking if ignition is turned on to check contact opening. With No. 1 piston on compression turn engine over until flywheel mark 'IGN/' (which is 6° before top dead center mark 'T-C/') registers with pointer in inspection hole in right hand rear motor support. Then loosen advance arm clamp bolt, rotate distributor until con-



FRONTENAC

MODEL 6-70 (1932), SERIAL NUMBERS 1302 UP
MODEL 6-85 (1932), SERIAL NUMBERS K-1001 UP
AUTO-LITE SYSTEM

tacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set gaps at .025 inch.

VALVE TIMING:—Valves located at right of engine. Camshaft driven from crankshaft by two-sprocket non-adjustable chain drive.

To Check Valve Timing. Set tappet clearance No. 1 exhaust valve at .012 inch. With No. 6 piston entering power stroke turn engine over until piston is slightly past top dead center with flywheel mark 'EXC./' (which is 5° after top dead center mark 'T-C./') registering with pointer in inspection hole in right hand rear motor support. No. 1 exhaust valve should close at this point. Reset tappet clearance at .008 inch.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 9/16"	11/32"	5 9/32"	45°	5/16"
Exhaust	1 7/16"	11/32"	5 9/32"	45°	5/16"

Tappet Clearance

	Operating	Timing
Intake	.006" (cold)	
Exhaust	.008" (cold)	.012" (cold)

Valve Springs

Closed—45 pounds.

Intake Valves

	Timing
Open	5° after top dead center.
Close	45° after lower dead center.

Exhaust Valves

	Timing
Open	40° before lower dead center.
Close	5° after top dead center.

CARBURETION:—Tillotson Updraft Carburetor, Model J-4A (6-70), J-7A (6-85) (see Carburetor Section for complete data).

Fuel Pump:—A.C. Mechanical Fuel Pump (see Equipment Section).

Gasoline Gauge:—Motometer electric type (see Equipment Section). The special Startix auxiliary switch will allow operation of gauge with engine stopped. To read gauge without starting engine, first open 'Startix switch' (see diagram), then turn on ignition. This switch can be used to prevent automatic cranking whenever desired, as in setting ignition timing.

STARTER:—Model MAB-4037. Starter drive—Bendix drive with Startix automatic starting switch. See Equipment Section for complete data on Startix. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	46
0.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
17.0 "	Lock	3.0	525
24.0 "	Lock	4.0	720

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect cable, take out flange mounting screws, pull forward to clear Bendix, lift out.

Oiling:—1000 Miles. Put 5-6 drops light oil in oiler on drive end.

GENERATOR:—Model GAL-4143. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate with standard setting 17-18 amperes at 8.0 volts (cold) reached at 1900 R.P.M.

Charging Rate Adjustment. Take off commutator cover band, shift third brush (by prying on brush mounting stud) counter-clockwise to increase, or clockwise to decrease charging rate. Brush is held in position by friction.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.3	600	0	6.4	700
4	6.7	740	4	6.9	900
8	7.1	900	8	7.4	1150
12	7.4	1120	10	7.7	1340
17	8.0	1900	12.4	8.0	2150
12	7.4	3200	9.5	7.7	3200

Brush Spring Tension:—22-25 ounces (main brushes), 31-34 ounces (third brush).

Field Current:—4.08-4.52 amperes at 6 volts across field terminals.

Motoring:—4.27-4.73 amperes at 6 volts.

Mounting:—Cradle mounted at left front of engine with fan belt drive. To remove, disconnect lead and water pump drive coupling, loosen mounting clamp band, slip off drive belt, lift generator from place.

Oiling:—500 Miles. Put 4-5 drops light engine oil in oiler at each end. 5000 Miles. Remove grease cup under bearing retainer on commutator end, clean out old grease, fill cup with medium grease, dip wick in engine oil and reassemble.

RELAY:—Model CB-4021S. Mounted on generator field frame. Contacts close at 675 R.P.M. with generator voltage of 7.0-7.5 volts and charging current of approximately 2 amperes and open with 5-2.5 ampere discharge current. **Contact Gap:**—.025-.035 inch. **Air Gap:**—.010-.030 inch (contacts closed).

LIGHTING:—(6-70) Clum Lighting Switch, Model 5192. Dimmer Switch Model 9126, (6-85) Soreng-Manegold Lighting Switch, Model 5670-AA. Dimmer Switch Model C-2100-A. Lighting switch mounted on back of instrument board. Lighting system 'depressed beam' type with double filament headlight bulbs controlled by dimmer switch on toeboard. Stop and tail light fitted with combination 21-2 cp. bulb.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome Lights	6-8	3	S.C.	63

FUSES:—Lighting fuse (on back of lighting switch) and accessory fuse (mounted on fuse block near ignition coil) are 20 ampere capacity.

GRAHAM

STANDARD SIX MODEL 65 (1933), SERIAL NUMBERS 1,605,001 UP
DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—Stamped on plate under floor mat near right rear door or under front seat cushion.

ENGINE NUMBER:—Stamped on plate on right side of crankcase.

ENGINE:—Six cylinder, 'L' head type, $3\frac{1}{4} \times 4\frac{1}{2}$ " bore and stroke, 224 cubic inch displacement, rated at 25.35 H.P., develops 85 H.P. at 3400 R.P.M. Standard compression ratio 6.5-1.

BATTERY:—Willard, Type WS-1-13, 6 volt, 13 plate, 86 ampere hour capacity (20 hour rate). Starting capacity 105 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—In cradle under right front seat.

Dimensions:—Width, $7\frac{1}{16}$ ". Length, $9\frac{1}{16}$ ". Height, $8\frac{13}{16}$ ".

IGNITION:—Coil Model 536-U. Unit with switch (primary lead between coil and ignition switch protected by armored cable).

Ignition Current:—2.0 amperes at 6 volts (engine running), 4 amperes at 6 volts (engine stopped).

Ignition Switch:—Model 428-H. Located at left of instrument panel. Connected to coil by armored cable (primary lead).

Distributor Model 632-Z. Single breaker, 6 lobe cam, full automatic advance type. Breaker contacts adjusted by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw.

Breaker Gap:—Set at .020". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
2	Start	500	1000		
21	10½	1950	3900		

Mounting:—Distributor mounted on left hand side of cylinder head. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance arm, lift distributor out. Distributor shaft is driven through an offset tongue-and-slot coupling.

Oiling:—1000 Miles. Turn down grease cup on side of shaft housing two full turns. Keep cup filled with medium cup grease. Take off distributor cap and rotor, saturate wick oiler in center of shaft with light engine oil, put one drop of oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

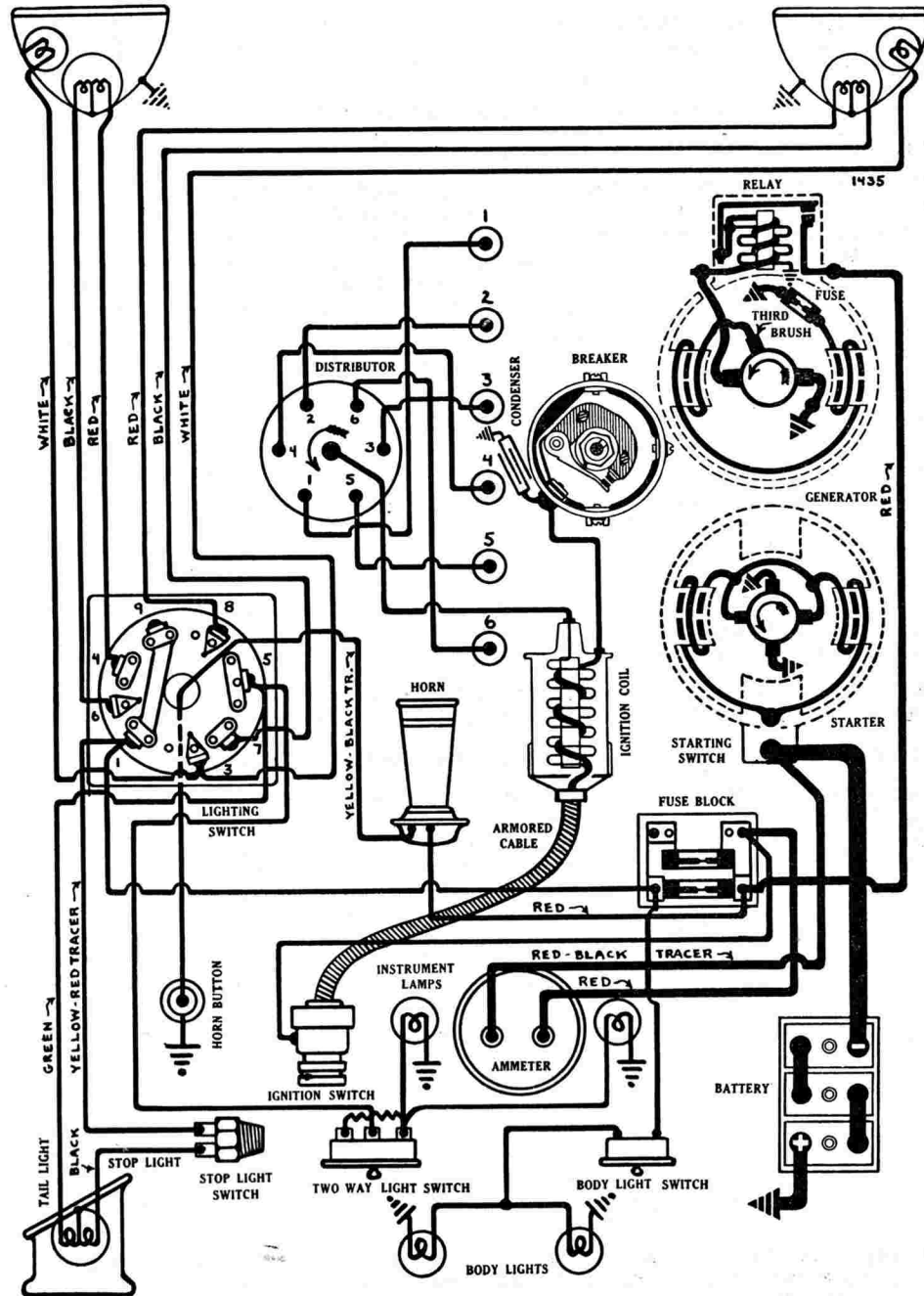
IGNITION TIMING:—Standard setting, 3° or $5/16$ " (flywheel), .0037" (piston travel) before top dead center.

To Set Ignition Timing. With No. 1 piston on compression stroke turn engine over by hand until piston reaches firing position (3° before top dead center) with flywheel mark 'SA-1' directly opposite pointer in inspection hole in flywheel housing. This mark is 3° or $5/16$ " before the top dead center mark 'DC-1'. Then loosen clamp bolt in advance arm, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:— $\frac{7}{8}$ -18 S.A.E. Std. Champion Type C-4-X. Set gaps at .025 inch.

VALVE TIMING:—Camshaft Setting. Camshaft at left of engine is chain driven from the crankshaft in tandem with accessory drive sprocket. Chain is adjusted manually by shifting accessory sprocket (see below). Sprockets are marked. To set timing, with crankshaft turned so that pistons Nos. 1 and



GRAHAM

STANDARD SIX MODEL 65 (1933), SERIAL NUMBERS 1,605,001 UP
DELCO-REMY SYSTEM

6 are on top dead center with flywheel mark 'D-C-1' at indicator in inspection hole in flywheel housing, mesh chain so there are exactly ten links or eleven pins between the marks on the sprockets (begin counting with pin in line with tooth meshed opposite mark on crankshaft sprocket and mesh tooth in line with the eleventh pin opposite mark on camshaft sprocket).

To Check Valve Timing. With piston No. 6 on top dead center entering power stroke set tappet clearance of No. 6 intake and exhaust valves at .012". Turn engine over one complete revolution and stop with piston on top dead center with flywheel mark 'D-C-1' in line with indicator in inspection hole in flywheel housing. No. 6 intake valve should begin to open at this point. No. 6 exhaust valve should close 10° after this point with flywheel mark 'E-C-1' at indicator. Reset tappet clearance at .010" (intake and exhaust) with engine hot.

Timing Chain Adjustment. Chain should be adjusted at least every 6000 miles. To take up chain, loosen two flange mounting screws on accessory sprocket mounting (water pump bracket) and back off adjustment screw lock nut. Turn up adjustment screw until chain begins to hum with engine running, back off adjustment until chain runs noiselessly, tighten lock nut and mounting screws.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.562"	.34075"	5.5"	30°	.318"
Exhaust	1.467"	.34075"	5.5"	45°	.327"

Tappet Clearance

	Operating	Timing		
Exhaust	.010" (hot)	.012" (cold)	Closed	55 pounds
Intake	.010" (hot)	.012" (cold)	Open	95 pounds

Valve Springs

Timing—Intake Valves

Open—at top dead center.
Close—40° or 4 3/16" (flywheel), .4125" (piston) after lower dead center.

Timing—Exhaust Valves

Open—40° or 4 3/16" (flywheel), .4125" (piston) before lower dead center.
Close—10° or 1 3/64" (flywheel), .0422" (piston) after top dead center.

CARBURETION:—Detroit Lubricator Updraft Carburetor, Model 51. See Carburetor Section for complete data. Manifold heat control is operated manually by button below instrument panel. Choke is operated manually by button on lower center of instrument panel.

Air Cleaner:—Oil-wetted wire mesh type. Remove at three-month intervals, clean by dipping in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical type mounted at left of crankcase and driven by eccentric on camshaft (see Equipment Section). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model 734-N, 734-R (R.H.D.). Starter drive, overrunning clutch and manual pinion shift connected to starting switch pedal linkage (Switch Type No. 820052 mounted on starter field frame). Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5.0	65
12 "	Lock	3.63	475

Mounting:—Flange mounted on right hand forward face of flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage, take off nuts on flange mounting bolts, pull starter forward to clear pinion housing, lift out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in commutator end oiler. Drive bearing in pinion housing is oilless.

GENERATOR:—Model 965-V. Third brush regulation. Rotation counter-clockwise at commutator end. With standard setting maximum charging rate is 17-19 amperes (cold) at 8.2-8.4 volts reached at 1700 R.P.M. or approximately 25 M.P.H.

Charging Rate Adjustment. Loosen the small round lock screw on the commutator end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
17-19	8.2-8.4	1700	13-15	7.7-8.0	1800-2000

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—1.75-2.25 amperes at 6 volts across field terminals.

Field Fuse:—6 ampere capacity.

Mounting:—Cradle mounted at right of engine and driven through flexible shaft from the water pump shaft. To remove, disconnect lead, disconnect drive shaft coupling, loosen mounting clamp band, lift generator out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler at each end.

RELAY:—Model 265-B. Mounted on generator field frame. Relay contacts close when generator voltage reaches 6.75-7.5 volts and open with discharge current of 0-2.5 amperes.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Clum Switch Model 9463. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Lighting system uses double-filament bulbs for 'depressed beam' dimming and switch has additional 'passing' position in which the upper filament (depressed beam) of the left hand headlight and lower filament (driving beam) of the right hand headlight are lighted (see diagram). Stop and tail light uses a double filament bulb.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21	D.C.	1116
Parking Bulbs	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158
Body Lights	6-8	3	S.C.	63

FUSES:—Lighting fuse mounted on fuse block on rear of dash is 20 ampere capacity. A spare fuse is mounted on the fuse block. Generator field fuse is 6 ampere capacity.

HORNS:—Klaxon Model K-31, Type 1362 (high note), Type 1363 (low note) where matched tone twin horns are installed. Current draw 4.0-6.5 amperes at 6 volts.

GRAHAM

STANDARD EIGHT MODEL 64 (1933), SERIAL NUMBERS 1,800,001 UP
CUSTOM EIGHT MODEL 57-A (1933), SERIAL NUMBERS 1,020,001 UP
DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On plate under floor mat near right rear door or under front seat cushion.

ENGINE NUMBER:—Stamped on plate on right hand side of crankcase.

ENGINE:—Eight cylinder, 'L' head type, $3\frac{1}{8} \times 4$ " bore and stroke, 245.4 cubic inch displacement, rated at 31.25 H.P., develops 95 H.P. at 3400 R.P.M. Standard compression ratio 6.5-1.

BATTERY:—Willard, Type WS-2-15, 6 volt, 15 plate, 100 ampere hour capacity (20 hour rate). Starting capacity 122 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—In cradle under right hand front seat.

Dimensions:—Width, $7\frac{1}{16}$ ". Length, $10\frac{5}{16}$ ". Height, $8\frac{13}{16}$ ".

IGNITION:—Coil Model 536-U. Unit with switch (primary lead between switch and coil protected by armored cable).

Ignition Current:—2.0 amperes at 6 volts (engine running), 4 amperes at 6 volts (engine stopped).

Ignition Switch:—Model 428-H. Assembled as unit with coil by means of armored cable protecting primary lead.

Distributor Model 661-J. Single breaker, 8 lobe cam, full automatic advance type. No synchronization of contacts necessary. Breaker contacts adjusted by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw.

Breaker Gap:—Set contact gap at .015". Hold within limits of .0125-.0175".

Breaker Arm Spring Tension:—19-23 ounces measured at point directly behind contacts with spring scale at right angles to back of breaker arm.

Engine	Distributor	Distributor	Engine
2.0	Start	500	1000
17	$8\frac{1}{2}$	2050	4100

Mounting:—Mounted on left hand side of cylinder head. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

Oiling:—1000 Miles. Turn down grease cup on side of shaft housing two full turns. Keep cup filled with medium cup grease. Take off distributor cap and rotor, saturate wick oiler in center of shaft with light engine oil, oil breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

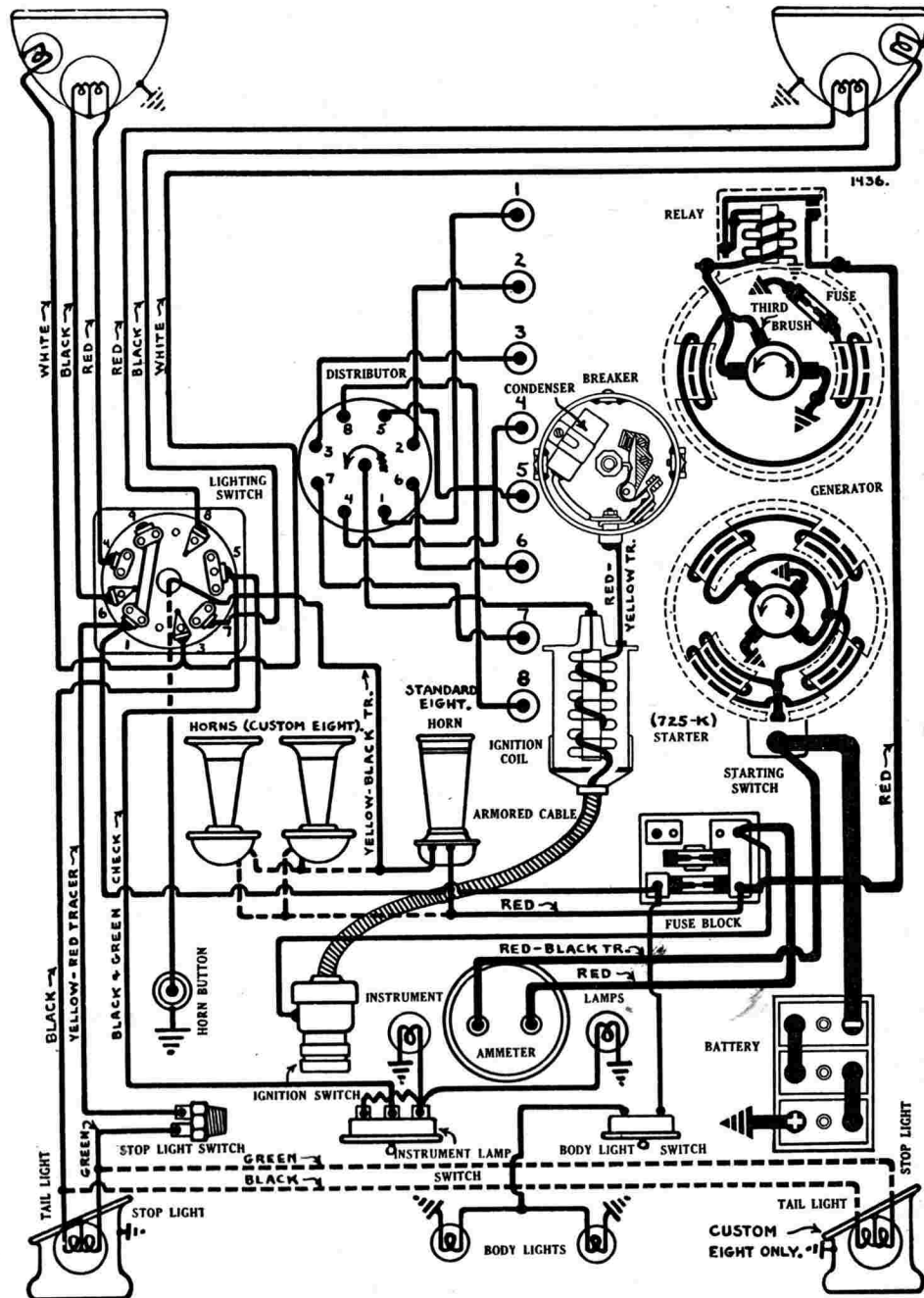
IGNITION TIMING:—Standard setting 3° or $5/16$ " (flywheel), .0034" (piston travel) before top dead center.

To Set Ignition Timing. With No. 1 piston on compression stroke, turn engine over by hand until piston reaches firing position (3° before top dead center) with flywheel mark 'SA-1' directly opposite pointer in inspection hole in flywheel housing. This mark is 3° or $5/16$ " before top dead center mark 'D-C-1'. Then loosen clamp bolt in advance arm, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:— $\frac{7}{8}$ -18 S.A.E. Std. Champion Type C-4-X. Set gaps at .025".

VALVE TIMING:—Camshaft Setting. Camshaft at left of engine is chain driven from the crankshaft in tandem with the accessory sprocket. Chain is adjusted manually by shifting accessory sprocket mounting (see below). Sprockets are marked. To set timing, with crankshaft turned so that pistons Nos. 1 and 8 are on top dead center with flywheel mark 'D-C-1' opposite indicator in inspection hole in flywheel housing, mesh chain so that there are exactly ten links or eleven pins between marks on sprockets (begin counting with pin in line with tooth meshed opposite mark on crankshaft



GRAHAM

STANDARD EIGHT MODEL 64 (1933), SERIAL NUMBERS 1,800,001 UP
CUSTOM EIGHT MODEL 57-A (1933), SERIAL NUMBERS 1,020,001 UP
DELCO-REMY SYSTEM

sprocket and mesh the tooth in line with the eleventh pin opposite the mark on the camshaft sprocket).

To Check Valve Timing. With piston No. 8 on top dead center entering power stroke, set tappet clearance of No. 8 intake and exhaust valves at .012". Turn engine over one complete revolution and stop with piston on top dead center with flywheel mark 'D-C-1' at indicator in inspection hole in flywheel housing. No. 1 intake valve should begin to open at this point. Turn engine over 10° further and stop with flywheel mark 'E-C-1' at indicator. No. 1 exhaust valve should close at this point. Reset tappet clearance at .010" running clearance (intake and exhaust) with engine hot.

Timing Chain Adjustment. Chain should be adjusted at least every 6000 miles. To take up chain, loosen two flange mounting screws on accessory sprocket mounting (water pump bracket) and back off adjustment screw lock nut. Turn up adjustment screw until chain begins to hum with engine running, back off adjustment until chain runs noiselessly, tighten lock nut and mounting screws.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.375"	34075"	4.894"	45°	.3145"
Exhaust	1.350"	34075"	4.894"	45°	.3195"

Tappet Clearance

Operating Timing		Valve Springs	
Intake	.010 (hot) .012" (cold)	Closed	50 pounds
Exhaust	.010" (hot) .012" cold	Open	109 pounds

Timing—Intake Valves

Open—At top dead center.
Close—40° or 4 3/16"—Standard, 3 59/64"—Custom (flywheel), .371" (piston) after lower dead center.

Timing—Exhaust Valves

Open —40° or 4 3/16"—Standard, 3 59/64"—Custom (flywheel), .371" (piston) before lower dead center.
Close—10° or 1 3/64"—Standard, 63/64"—Custom (flywheel), .037" (piston) after top dead center.

CARBURETION:—Detroit Lubricator Updraft Carburetor Model 51. See Carburetor Section for complete data. Manifold heat control is operated manually by button below instrument panel with seasonal adjustment at carburetor. Choke is operated manually by button on lower left center of instrument panel.

Air Cleaner:—Oil-wetted wire mesh type. Remove complete unit at three-month intervals, clean by dipping in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical type mounted on left side of crankcase and driven by eccentric on camshaft (see Equipment Section for complete data). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—K-S Telegauge hydrostatic type (see Equipment Section).

STARTER:—Model 734-N, 734-R (R.H.D.). (Standard) 725-K (Custom Models). Starter drive—Overrunning clutch and mechanical pinion shift connected to starting switch pedal (starter switch Type No. 820052 mounted on starter field frame). Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

Starter Data—Model 734-N, R

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5.0	65
12 "	Lock	3.0	475

Starter Data—Model 725-K

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5.0	60
16 "	Lock	3.0	600

Mounting:—Flange mounted on right hand forward face of flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage, take off nuts on flange mounting bolts, pull starter forward to clear pinion housing, lift out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in commutator end oiler. Drive bearing in pinion housing is oilless.

GENERATOR:—Model 965-V. Third brush regulation. Rotation counter-clockwise at commutator end. With standard setting maximum charging rate is 17-19 amperes (cold) at 8.2-8.4 volts reached at 1700 R.P.M. or approximately 25 M.P.H.

Charging Rate Adjustment. Loosen the small round lock screw on the commutator end plate, take off comutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test		Hot Test	
Amperes	Volts	Amperes	R.P.M.
17-19	8.2-8.4	13-15	7.7-8.0

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—1.75-2.25 amperes at 6 volts across field terminals.

Field Fuse:—6 ampere capacity.

Mounting:—Cradle mounted at right of engine and driven through flexible shaft from the water pump shaft. To remove, disconnect lead, disconnect drive shaft coupling, loosen mounting clamp band, lift generator out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler at each end.

RELAY:—Model 265-B. Mounted on generator field frame. Relay contacts close when generator voltage reaches 6.75-7.5 volts and open with discharge current of 0-2.5 amperes.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Clum Switch Model 9463. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Lighting system uses double-filament bulbs for 'depressed beam' dimming and switch has additional 'passing' position in which the upper filament (depressed beam) of the left hand headlight and lower filament (driving beam) of the right hand headlight are lighted (see diagram). Stop and tail light uses a double filament bulb.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21	D.C.	1116
Parking Bulbs	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158
Body Lights	6-8	3	S.C.	63

FUSES:—Lighting fuse mounted on fuse block on rear of dash is 20 ampere capacity. A spare fuse is mounted on the fuse block. Generator field fuse is 6 ampere capacity.

HORNS:—(Custom Eight). Klaxon Model K-26-C, Type 1413 (low note), 1414 (high note), twin horns (matched tone) mounted under engine hood. Horn relay is not used. Current draw of horns 6.0-8.5 amperes at 6 volts (low note), 5.0-6.5 amperes at 6 volts (high note).

HUDSON

SUPER SIX MODEL (1933), SERIAL NUMBERS 1,300,501 UP AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—Stamped on plate on dash under engine hood. First serial number 1,300,501.

ENGINE NUMBER:—Stamped on left hand side of cylinder block opposite No. 3 cylinder. First serial number 2001.

ENGINE:—Six cylinder, 'L' head type, 2 15/16x4 3/4" bore and stroke, 193 cubic inch displacement, rated at 20.7 H.P., develops 73 H.P. at 3200 R.P.M. (standard compression head engine) or 80 H.P. at 3200 R.P.M. (high compression head engine). Standard compression ratio 6.2-1. Optional high compression ratio 7.1-1. Standard compression head engines are not marked. High compression head engines may be distinguished by plate on left hand side of engine designating engine as 7.1 compression ratio to be operated only with ethylized fuel.

BATTERY:—Exide, Type 3-VXA-15-1, 6 volt, 15 plate, 100 ampere capacity (20 hour rate). Starting capacity 114 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—In cradle on right hand frame member under driver's seat.

Dimensions:—Width, 7". Length, 10 9/32". Height, 9 7/32".

IGNITION:—Coil Model IG-4605. Mounted on dash. Connected to ignition switch by armored cable (primary lead).

Ignition Current:—1-3 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped).

Ignition Switch:—Type 16-S Electrolock assembled as unit with coil. Switch has two 'on' positions. First 'on' position with key turned approximately 1/8 turn to right is used for timing or to secure gasoline gauge reading when automatic cranking is not desired. Second 'on' position with key turned to extreme right (approximately 1/4 turn) is ordinary running position with ignition on and Startix operative.

Distributor Model IGB-4074A. Single breaker, 6-lobe cam, full automatic advance type. To adjust contact gap, loosen lock nut on stationary contact stud, turn up stud, tighten lock nut.

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.020".

Breaker Arm Spring Tension:—16-22 ounces measured at tip of breaker arm with spring scale centered on arm and at right angles to breaker arm.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start	400	800		
8	4	825	1650		
16	8	1250	2500		
24	12	1675	3350		
30	15	2000	4000		

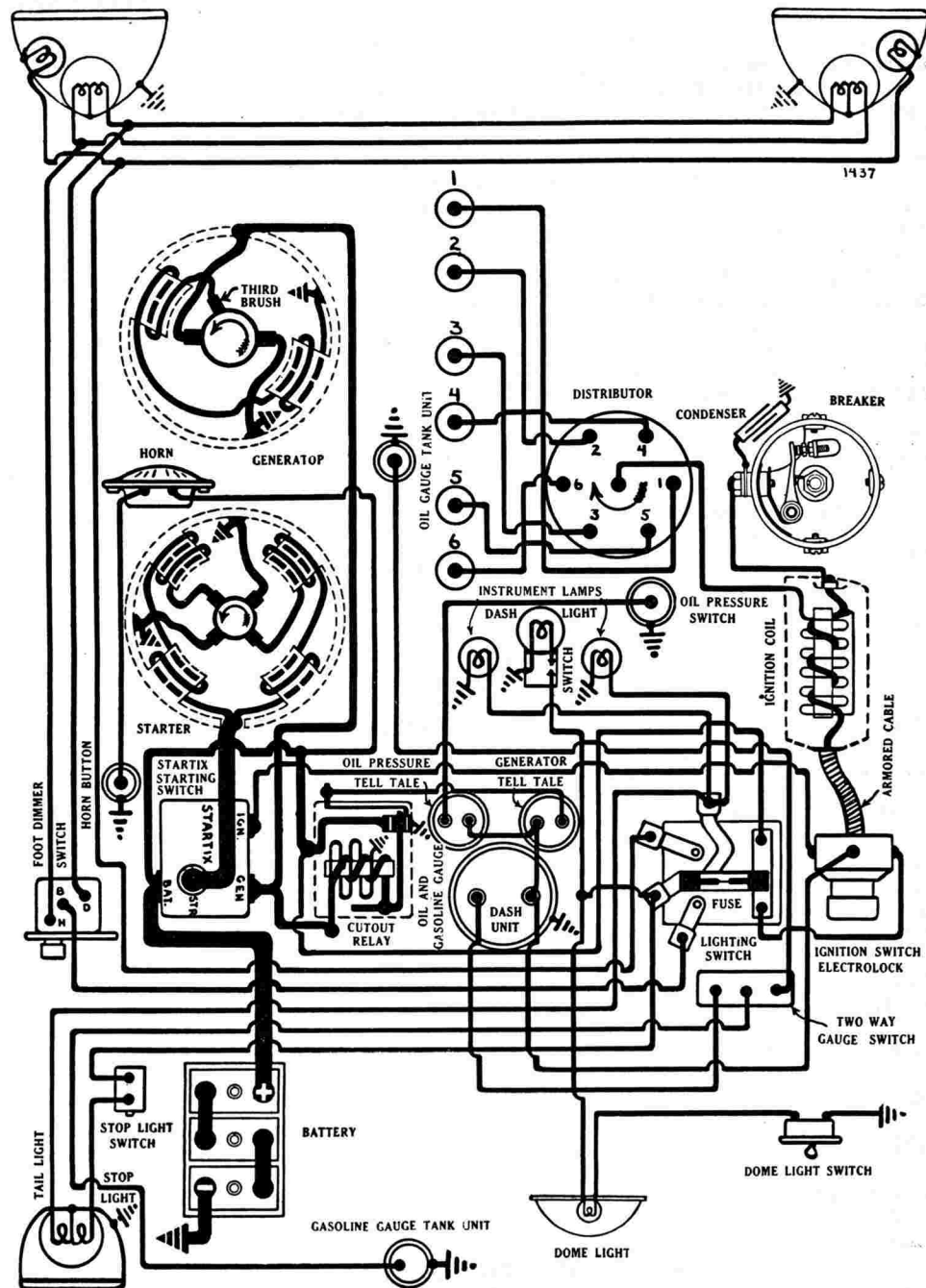
Mounting:—Distributor mounted at right center of crankcase and driven from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

Oiling:—2000 Miles. Fill distributor base to level of oiler under distributor cup with light engine oil. Take off distributor cap and rotor, put one drop of oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Three distinct ignition settings are used, depending upon type of engine (compression ratio) and fuel characteristics:

1. Standard head—standard fuel:—Top dead center.
2. Standard head—Ethyl fuel:—3/4" (flywheel), or .0262" (piston travel) before top dead center.
3. High compression head—Ethyl fuel:—Top dead center.

To Set Ignition Timing. Loosen hold-down screw in advance plate, rotate distributor clockwise to extent of advance plate slot, tighten screw. With No. 1 piston on compression, turn engine over by hand until piston reaches top dead center with flywheel mark 'U.D.C.1-6/' at the pointer in the inspection hole in the right hand forward face of the flywheel housing (mark should be 3/4 inch before mark for Standard head Ethyl fuel setting). Loosen hold-down screw in advance plate, rotate distributor counter-clockwise until contacts begin to open, tighten hold-down screw. See that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.



HUDSON

**SUPER SIX MODEL (1933), SERIAL NUMBERS 1,300,501 UP
AUTO-LITE SYSTEM**

If ignition is turned on to check contact opening, use first 'on' position of switch to avoid automatic cranking (see 'Ignition Switch').

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—14 MM. Metric. Champion Type J-7. Set gaps at .020-.025".

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is gear driven from the crankshaft. Gears are marked. Mesh gears so that marks are adjacent and in line with straightedge across the shaft centers.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 3/8"	5/16"	5 3/32"	45°	11/32"
Exhaust	1 3/8"	5/16"	5 3/32"	45°	11/32"

Tappet Clearance

	Valve Springs
Intake	.004" (hot). Closed 53 pounds
Exhaust	.006" (hot).

CARBURETION:—Marvel Updraft Carburetor, Model VE-3 (see Carburetor Section for complete data). Manifold heat control is automatic. Carburetor choke control is operated manually by button on instrument panel.

Fuel Pump:—A.C. Mechanical fuel pump mounted on right hand side of crankcase and operated by eccentric on camshaft (see Equipment Section for complete data).

Gasoline and Oil Gauge:—Motometer electric type combination gasoline and oil gauge (see Equipment Section). Gauge operates as gasoline gauge with ignition turned 'on'. Oil reading obtained by pressing button on selector switch under center of instrument board.

STARTER:—Model MAJ-4025. Starter drive—Inboard Bendix drive with Startix automatic starting switch (mounted with relay on left hand side of engine block). See Equipment Section for complete data on Startix. Starter rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces each.

Starter Data

Torque	R.P.M.	Volts	Amperes
.3 lb. ft.	2500	5.5	100
2.25 "	1450	5.0	200
4.6 "	960	4.5	300
7.3 "	575	4.0	400
10.3 "	225	3.5	500
12.6 "	Lock	3.0	575
19.0 "	Lock	4.0	805

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect cable, take out 3 flange mounting cap screws, pull starter straight forward to clear Bendix, lift out.

Oiling:—1000 Miles. Put 3-4 drops light engine oil (fill cups once) in oiler at each end of armature shaft.

GENERATOR:—Model GAM-4503. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate 17 amperes (cold) at 8 volts reached at 2400 R.P.M. Signal light (generator tell-tale) used instead of dash ammeter.

Charging Rate Adjustment. Take off commutator cover band. Shift third brush by prying on brush mounting stud counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction. For all charging rate adjustments an ammeter must be connected in the generator line at the relay.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	700	0	6.4	760
4	6.9	880	4	6.9	1040
7	7.0	1000	8	7.3	1400
10	7.2	1180	10	7.5	1600
14	7.8	1520	12.8	7.9	2550
17	8.0	2400	12.2	7.8	3200
15.2	7.9	3200			

Brush Spring Tension:—18-22 ounces on each brush.

Field Current:—4.08-4.52 amperes at 6.0 volts across field terminals.

Motoring:—4.94-5.46 amperes at 6.0 volts.

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine and slip off drive belt, take out two bolts under generator forming bracket hinge, lift generator out.

Belt Adjustment. Loosen mounting bolts and adjustment clamp bolt, swing generator out or away from engine, tighten adjustment bolt before slacking off on generator, tighten mounting bolts. Belt tension should be just enough to drive fan and generator without slipping.

Oiling:—1000 Miles. Put 3-4 drops light engine oil in oiler at each end. Ball bearing at drive end is packed with grease when assembled. Plain bearing at commutator end is oiled by wick in oil well.

RELAY:—Model CBA-4002. Special type with auxiliary contacts and terminal for operation of generator charge tell-tale. Tell-tale contacts are closed with main contacts open, and open when main contacts close (as generator begins to charge battery). Relay contacts close when generator voltage reaches 7.0-8.0 volts with charging current of not more than 5 amperes and open with discharge current of 5-2.5 amperes.

Contact Gap:—.025-.035". **Air Gap:**—.010-.030" (contacts closed).

SIGNAL LIGHTS:—These consist of battery charge tell-tale and oil pressure tell-tale lights mounted on instrument panel instead of conventional ammeter and oil pressure gauge. Light bulbs are standard 6-8 volt, 3 cp. D.C. Mazda Number 64 and can be removed by turning light counter-clockwise slightly to release bayonet socket pin.

Battery Charge Tell-tale. Under ruby reflector on right center of instrument panel. Tell-tale should light when ignition is turned 'on' with car stopped and should continue to burn until generator begins to charge (when relay contacts close). If tell-tale light does not burn when ignition is turned on and at idling speeds, check bulb by grounding tell-tale terminal on relay (left hand terminal) to generator field frame. If tell-tale does not light, replace bulb. If lamp lights when terminal is grounded, check auxiliary contact spring, contacts, and ground strap. See that auxiliary contacts are closed with main contacts open. If tell-tale lamp lights when car is operated at speeds above idling speed, the generator or relay is defective.

Oil Pressure Tell-tale. Under ruby reflector or left center of instrument panel. Tell-tale should light when ignition is turned 'on' with car stopped but should go out when car is operated. Tell-tale should not light or flash at speeds above idling. If tell-tale does not light when ignition is turned on, check bulb by grounding terminal on oil pressure check valve or control switch (on right side of crankcase) to engine. If tell-tale does not light, replace bulb. If tell-tale does not flash at idling speeds, disassemble check valve and clean out by-pass hole behind plunger, see that terminal pin is straight and clean, and that plunger is free to move in housing.

LIGHTING:—Soreng-Manegold Switch, Model B-5670-A. Dimmer Switch Model C-2100-A. Lighting switch mounted on back of instrument board and controlled by push-pull button at lower left center of instrument panel. Headlights equipped with double filament bulbs for 'depressed beam' dimming controlled by foot-operated switch on toeboard. Parking bulbs (in headlights) or fender lights are standard equipment. Stop and tail light fitted with double filament bulb.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking or Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tell-tale Lights	6-8	3	D.C.	64
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome Lights	6-8	15	S.C.	87

FUSES:—30 ampere capacity fuse mounted on back of lighting switch.

**EIGHT CYLINDER STANDARD SERIES (1933), SERIAL NUMBERS 936,703 UP
EIGHT CYLINDER MAJOR SERIES (1933), SERIAL NUMBERS 251,117 UP
AUTO-LITE SYSTEM**

ENGINE NUMBER:—Stamped on left hand side of cylinder block opposite No. 1 cylinder. First serial number (both Standard and Major Series) 63,501.

ENGINE:—Eight cylinder, 'I' head type, 3x4½" bore and stroke, 254 cubic inch displacement, rated at 28.8 H.P., develops 101 H.P. at 3600 R.P.M. (standard compression head engine) or 110 H.P. at 3600 R.P.M. (optional high compression head engine). Standard compression ratio 5.8-1. High compression ratio 6.5-1. Compression ratio of each engine is marked by figure cast in upper surface of cylinder head casting.

BATTERY—Exide, Type 3-VXA-15-1, 6 volt, 15 plate, 100 ampere hour capacity (20 hour rate). Starting capacity 114 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—In cradle on left hand frame side rail under driver's seat.

Dimensions:—Width, 7". Length, 10 $\frac{7}{32}$ ". Height, 9 $\frac{7}{32}$ ".

IGNITION:—Coil Model CE-4017. Coil mounted on cylinder head above water header.

Ignition Current:—2 amperes at 6 volts (engine running), 5 amperes at 6 volts (engine stopped).

Ignition Switch:—Type 15-S Electrolock assembled as unit with distributor. Switch has two 'on' positions. Left hand 'on' position is timing position and should be used for setting timing or gasoline gauge reading when automatic cranking is not desired. Right hand 'on' position is regular running position with ignition on and Startix operative.

Distributor Model IGB-4009B. Two-breaker arm, 4-lobe cam, full automatic advance type. Contacts open alternately at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Timing).

Engine	Distributor	Distributor	Engine
0.....	Start.....	400.....	800
8.....	4.....	780.....	1560
16.....	8.....	1140.....	2280
24.....	12.....	1500.....	3000
35.....	17½.....	2000.....	4000

Mounting:—On accessory bracket at right front of engine. Electrolock must be removed as unit with distributor. To remove, disconnect wires and free Electrolock at dash, take off distributor cap, take out hold-down screw in advance plate, lift distributor out (see Equipment Section for data on Electrolock).

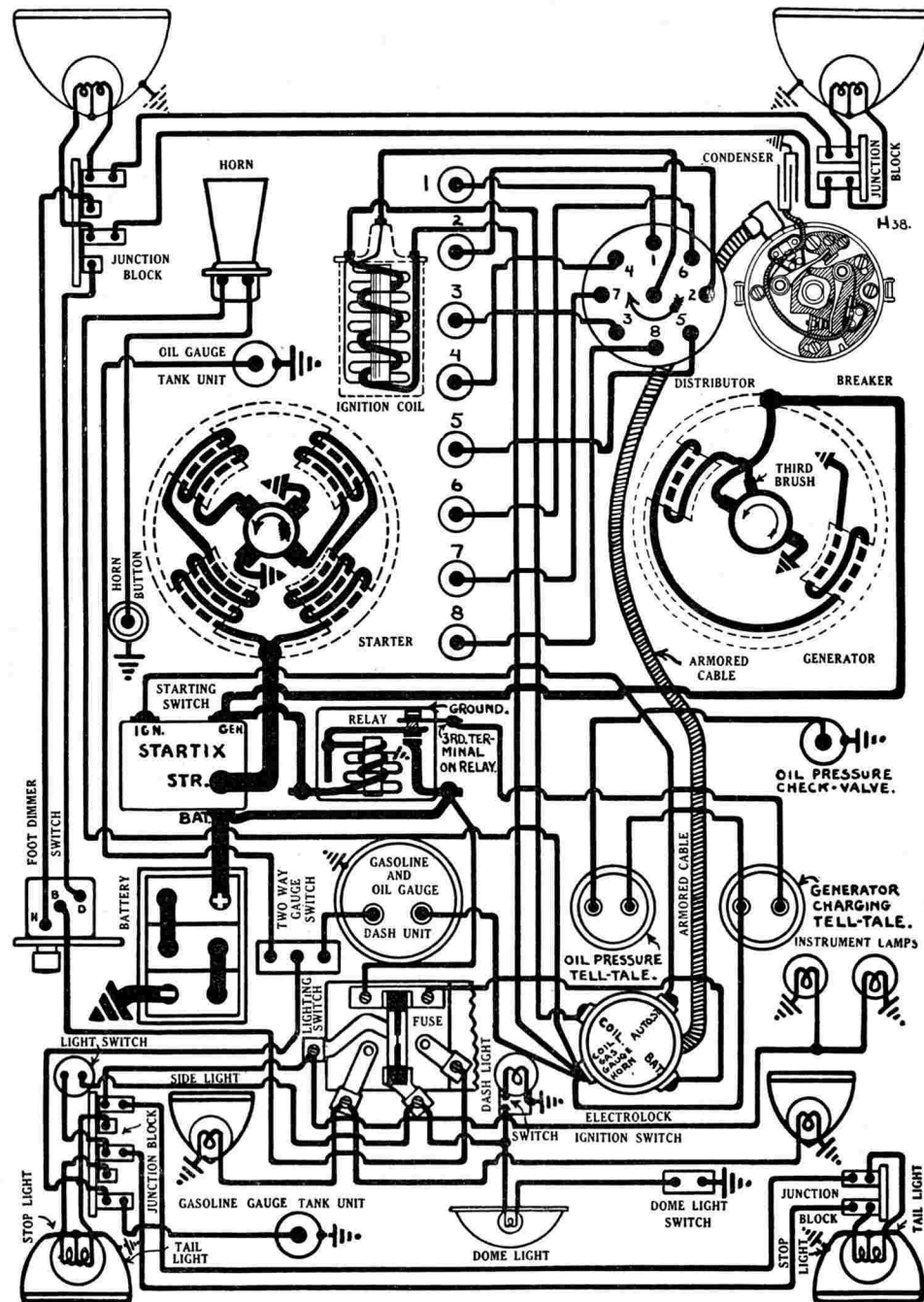
Oiling:—2000 Miles. Fill distributor base to level of oiler under distributor cup with light engine oil. Take off distributor cap and rotor, put one drop of oil on breaker arm pivot pins and apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Three distinct ignition settings are used, depending upon type of engine (compression ratio) and fuel characteristics:

1. Standard head—standard fuel:—Top dead center.
2. Standard head—Ethyl fuel:— $1\frac{1}{4}$ " (flywheel) or .0625" (piston travel) before top dead center.
3. High compression head—Ethyl fuel:—Top dead center.

3. To Set Ignition Timing. Loosen hold-down screw in advance plate, rotate distributor clockwise to full extent of advance plate slot, tighten hold-down screw. With No. 1 piston on compression stroke, turn engine over by hand until piston reaches top dead center with flywheel mark 'D.C.I-8/' opposite pointer in inspection hole in right hand front face of flywheel housing (or $1\frac{1}{4}$ " before the pointer on standard compression engines using Ethyl fuel exclusively). Then loosen hold-down screw in advance plate, rotate distributor counter-clockwise until first or fixed set of contacts open, tighten hold-down screw, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated. The second or movable set of contacts must be timed by synchronizing contacts and car should be tested for correct performance after timing has been completed (see below).

Synchronization of Contacts—first method. After first or fixed set of contacts has been timed to engine (above) turn engine over 90° or 1/4 revolution to firing position of piston No. 6 with flywheel mark 'D.C.3-6/' at



HUDSON

EIGHT CYLINDER STANDARD SERIES (1933), SERIAL NUMBERS 936,703 UP EIGHT CYLINDER MAJOR SERIES (1933), SERIAL NUMBERS 251,117 UP AUTO-LITE SYSTEM

indicator (or 1 1/4" before for Ethyl fuel setting). Then loosen lock screws on movable breaker sub-plate carrying second set of contacts, shift plate until second or movable set of contacts begin to open, tighten lock screws.

Synchronization of Contacts—second method. Use special Auto-Lite synchronizing tool and follow complete directions in Equipment Section.

Final Performance Test. Car should be road tested after ignition has been set, to check performance. A slight spark knock should be audible when the car is accelerated from 10 to 25 M.P.H. with wide open throttle on a level road. If the knock is too noticeable, loosen hold-down screw and retard setting by turning distributor one-half division on scale clockwise at a time until knock can just be heard by driver. If knock is not heard, advance setting by turning distributor counter-clockwise one division on the scale at a time until knock becomes audible. Continue test and change adjustment until correct setting is secured.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion Type A-7. Set gaps at .020-.025".

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine is driven by chain from the crankshaft in tandem with accessory sprocket. Chain is adjusted manually (see below). Sprockets are marked by marks on two adjacent teeth on each sprocket. Mesh chain so that there are 18 links or 19 pins between marks on sprockets (begin count with pin in line with tooth meshed between marks on camshaft sprocket and mesh tooth in line with nineteenth pin between marks on crankshaft sprocket).

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 1/2"	5/16"	5 3/32"	45°	11/32"
Exhaust	1 3/8"	5/16"	5 3/32"	45°	11/32"

Tappet Clearance

Intake	.004" (hot).
Exhaust	.006" (hot).

Valve Springs

Closed	53 pounds.
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Timing Chain Adjustment. Adjust chain at end of first 1500 miles and at 5000-mile intervals throughout life of car, or whenever play on circumference of generator coupling exceeds 1/8" (excluding slack of coupling bolts). To take up chain, loosen three bolts in accessory bracket (top inside and lower bolt pass through notches in eccentric and must be removed). Engage special wrench on eccentric nut between bracket and chain case, turn nut clockwise until slack on coupling is 1/8", tighten mounting bolts (slack off adjustment slightly if necessary in order to insert bolts). If bracket is taken off engine, take out pipe plug directly above shaft and fill bracket with 1/2 pint engine oil before engine is operated.

CARBURETION:—Marvel Updraft Carburetor, Model VH-4 (see Carburetor Section for complete data). Manifold heat control is automatic. Choke is manually controlled by button on instrument panel.

Fuel System:—Stewart-Warner Vacuum Tank is standard equipment.

Gasoline and Oil Gauge:—Motometer electric type gasoline and oil gauge (see Equipment Section).

STARTER:—Model MAB-4041. Starter drive—Inboard Bendix drive with Startix automatic starting switch (mounted with relay on left hand side of engine block). See Equipment Section for complete data on Startix. Starter rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4000	5.5	46
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	700	4.5	300
10.2 "	420	4.0	400
17.0 "	Lock	3.0	525
24.0 "	Lock	4.0	725

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect cable, take out 3 flange mounting screws, pull starter straight forward to clear Bendix, lift out.

Oiling:—1000 Miles. Put 3-4 drops light engine oil in oiler at each end of armature shaft (fill cups once).

GENERATOR:—Model GAL-4544. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate 17 amperes at 8.0 volts (cold) reached at 1900 R.P.M. Signal (charging tell-tale) light used instead of dash ammeter. Test ammeter must be connected in generator line when charging rate is checked or adjusted.

Charging Rate Adjustment. Take off commutator cover band. Shift third brush by prying on brush mounting stud counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.3	600	0	6.4	700
4	6.4	740	4	6.9	900
8	7.1	900	8	7.4	1150
12	7.4	1120	10	7.7	1340
17	8.0	1900	12.4	8.0	2150
12	7.4	3200	9.5	7.7	3200

Brush Spring Tension:—18-22 ounces on each brush.

Field Current:—4.08-4.52 amperes at 6.0 volts across field terminals.

Motoring:—4.27-4.73 amperes at 6.0 volts.

Mounting:—Cradle mounted at right of engine and driven by shaft from accessory bracket. To remove, disconnect lead, disconnect drive coupling, loosen mounting clamp band, lift generator out.

Oiling:—1000 Miles. Put 3-4 drops light engine oil in oiler at each end (fill oil cups once).

RELAY:—Model CBA-4002. Special type with auxiliary contacts and terminal for operation of generator charge tell-tale. Tell-tale contacts are closed with main contacts open, and open when main contacts close (as generator begins to charge battery). Relay contacts close when generator voltage reaches 7.0-8.0 volts with charging current of not more than 5 amperes and open with discharge current of .5-2.5 amperes.

Contact Gap:—.025-.035". **Air Gap:**—.010-.030" (contacts closed).

SIGNAL LIGHTS:—These consist of battery charge tell-tale and oil pressure tell-tale lights mounted on instrument panel instead of conventional ammeter and oil pressure gauge. Light bulbs are standard 6-8 volt, 3 cp. D.C. Mazda Number 64 and can be removed by turning light counter-clockwise slightly to release bayonet socket pin. For complete data see 'Signal Light' paragraph on Hudson Six.

LIGHTING:—Soreng-Manegold Switch, Model B-5670-A. Dimmer Switch Model C-2100-A. Lighting switch mounted on back of instrument board and controlled by push-pull button at lower left center of instrument panel. Headlights equipped with double filament bulbs for 'depressed beam' dimming controlled by foot-operated switch on toeboard. Parking bulbs (in headlights) or fender lights are standard equipment. Stop and tail light fitted with double filament bulb.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking or Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tell-tale Lights	6-8	3	D.C.	64
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome Lights	6-8	15	S.C.	87

FUSES:—30 ampere capacity fuse mounted on back of lighting switch.

HUPMOBILE

SERIES 321, MODEL K (1933), SERIAL NUMBERS K-5001 UP

AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—On right side of dash under hood. First serial number K-5001.

ENGINE NUMBER:—Stamped on left side of crankcase.

ENGINE:—Six cylinder, 'L' head type, $3\frac{3}{8} \times 4\frac{1}{4}$ " bore and stroke, 228.1 cubic inch displacement, N.A.C.C. rating—27.34 H.P., develops 90 H.P. at 3800 R.P.M. Standard compression ratio 5.75-1. Optional low compression ratio 5.25-1.

BATTERY:—Willard, Type WH-2-15, 6 volt, 15 plate, 119 ampere hour capacity (20 hour rate). Starting capacity 140 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—Battery mounted on left frame member under driver's seat.

Dimensions:—Width, 7 $\frac{1}{16}$ ". Length, 10 $\frac{5}{16}$ ". Height, 9 $\frac{5}{16}$ ".

IGNITION:—Coil Model IG-4604. Mounted on dash. Switch is a unit with the coil.

Ignition Current:—1-3 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped).

Ignition Switch:—Electrolock, Model 16-B. Ignition switch integral with coil. Lead from switch to coil is armored.

Distributor Model IGC-4056. Single breaker, 6-lobe cam, semi-automatic advance type. Manual advance is controlled by button at lower left center of instrument panel. Spark is retarded with button pulled out. Pushing in spark control button toward dash advances distributor 24° (engine). Breaker contact gap adjusted by loosening lock nut on stationary contact mounting stud and turning up stud.

Breaker Gap:—Set contact gap at .015-.018 inch.

Breaker Arm Spring Tension:—16-22 ounces measured at tip of breaker arm with spring scale at right angles to back of arm.

Degrees		Automatic Advance		R.P.M.	
Engine	Distributor	Distributor	Engine		
0.....	Start.....	400.....	800		
4.....	2.....	685.....	1370		
8.....	4.....	975.....	1950		
12.....	6.....	1265.....	2530		
14.....	7.....	1400.....	2800		

Mounting:—Distributor mounted at left center of crankcase and driven by an inclined shaft from the camshaft. To remove, disconnect primary lead, disconnect manual advance control, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

Oiling:—1000 Miles. Put 4-5 drops light engine oil in oiler on side of distributor. Take off distributor cap and rotor, put one drop of oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

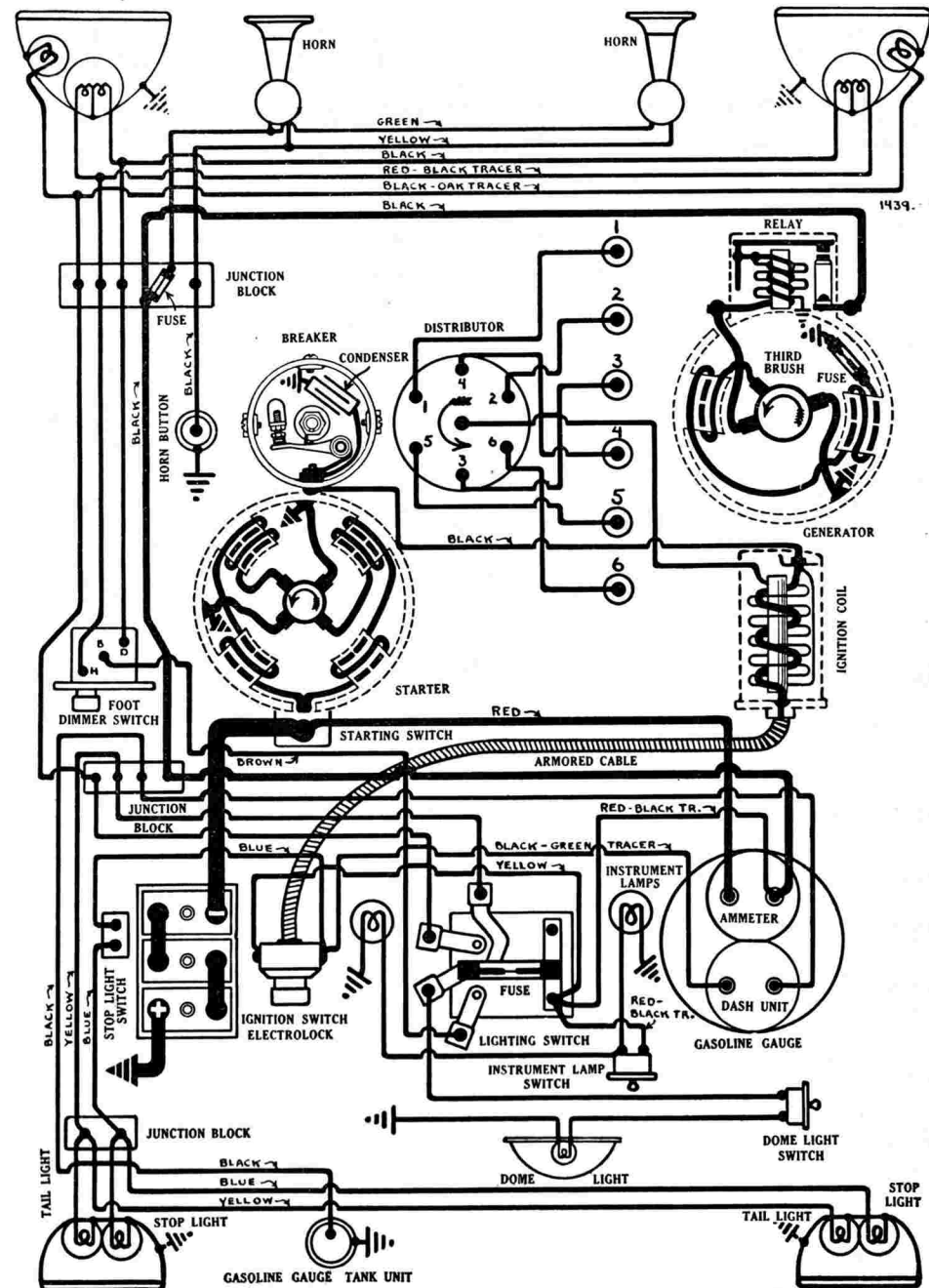
IGNITION TIMING:—Standard Setting— 7° (flywheel) or .0193" (piston travel) before top dead center with manual spark control advanced.

To Set Ignition Timing. Advance manual spark control (push button in toward dash) and see that distributor is rotated clockwise to limit of advance arm slot. With No. 1 piston on compression, turn engine over by hand until the ignition mark on the flywheel (which is 7° before top dead center mark 'DC/1-6') is in line with finished bosses on front face of clutch housing at right of engine. Then loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set gaps at .026-.030".

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is chain



HUPMOBILE

SERIES 321, MODEL K (1933), SERIAL NUMBERS K-5001 UP
AUTO-LITE SYSTEM

driven from the crankshaft in tandem with generator drive sprocket. Sprockets are marked. To set timing, with crankshaft turned so that pistons Nos. 1 and 6 are at top dead center, and with camshaft turned so that No. 1 cylinder valves are closed, mesh chain so that marks on sprockets are adjacent and in line with a straightedge laid across the shaft centers. Chain is adjusted manually by shifting generator (see Generator Mounting).

To Check Valve Timing. With No. 1 piston on top dead center entering power stroke set tappet clearance of No. 1 valves at .014" (intake), .017" (exhaust). Turn engine over one complete revolution and stop with piston on top dead center when flywheel mark 'DC/1-6' registers with finished bosses on front face of clutch housing in inspection hole at right of engine. Both No. 1 intake and exhaust valves should be closed at this point. Reset tappet clearance .010" (intake), .013" (exhaust) with engine warm.

Valve Specifications

	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1.651-1.661"	.3405-.3415"	45°	11/32"
Exhaust	1.526-1.536"	.3405-.3415"	45°	11/32"

Tappet Clearance

	Operating Timing	Closed	31-37 pounds—2 3/16".
Intake	.010" (hot) .014" (cold)	Open	.82-88 pounds—1 27/32".
Exhaust	.013" (hot) .017" (cold)		

Valve Springs

Timing

Intake Valves	Exhaust Valves
Open—2° before top dead center.	Open—44° before lower dead center.
Close—51° after lower dead center.	Close—3° after top dead center.

CARBURETION:—Carter Downdraft Carburetor, Model 258-S (see Carburetor Section for complete data). Manifold heat control and choke are operated manually by buttons on instrument panel.

Air Cleaner:—A.C. oil-wetted wire mesh type air cleaner. Remove complete unit when necessary, clean wire mesh by dipping in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—Stewart-Warner mechanical type operated by eccentric on camshaft (see Equipment Section for complete data). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—Stewart-Warner electric type (see Equipment Section).

STARTER:—Model MAB-4050. Starter drive—Bendix drive with starter switch mounted on starter field frame and operated by flexible control by button at extreme lower left corner of instrument panel. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4000	5.5	46
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	700	4.5	300
10.2 "	420	4.0	400
17.0 "	Lock	3.0	525
24.0 "	Lock	4.0	725

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect cable and starting switch control, take out flange mounting cap screws, pull starter forward to clear Bendix, lift out.

Oiling:—1000 Miles. Put 5-6 drops light engine oil in oiler at drive end of armature. Commutator end bearing is oilless.

GENERATOR:—Model GAL-4524. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate 17 amperes (cold) at 8.0 volts reached at 1900 R.P.M.

Charging Rate Adjustment. Take off commutator cover band, shift third brush by prying on brush mounting stud counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.3	600	0	6.4	700
4	6.7	740	4	6.9	900
8	7.1	900	8	7.4	1150
12	7.4	1120	10	7.7	1340
17	8.0	1900	12.4	8.0	2150
12	7.4	3200	9.5	7.7	3200

Brush Spring Tension:—18-22 ounces on each brush.

Field Current:—4.08-4.52 amperes at 6.0 volts across field terminals.

Field Fuse:—7½ ampere capacity.

Motoring:—4.27-4.73 amperes at 6.0 volts.

Mounting:—Flange mounted on right hand rear face of timing chain case. To remove, disconnect lead, back off chain adjustment set screw, take out 3 flange mounting cap screws, lift off timing chain, lift generator out. Tie up timing chain and do not crank engine with generator out.

Timing Chain Adjustment. Timing chain should be adjusted at end of first 1000 miles and at 5000 mile intervals afterward. To take up chain, back off lock nut on adjusting screw, loosen 3 flange mounting screws, turn up adjusting screw until chain begins to hum with engine running, back off adjustment until chain runs noiselessly, tighten lock nut and mounting screws.

Oiling:—1000 Miles. Put 5-6 drops light engine oil in commutator end oiler. Drive end bearing is oiled from chain case.

RELAY:—Model CB-4021. Relay mounted on generator field frame. Contacts close when generator voltage reaches 7-7.5 volts with charging current of approximately 2 amperes and open with discharge current of .5-2.5 amperes. **Contact Gap:**—.025-.035". **Air Gap:**—.010-.030" with contacts closed.

LIGHTING:—Soreng-Manegold Switch, Model D-5670-A. Dimmer Switch Model A-2100-A. Lighting switch mounted on back of instrument board and operated by push-pull button at lower right center of instrument panel. Double filament headlight bulbs are used for 'depressed beam' dimming and are controlled by foot-operated switch on toeboard.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Parking Bulbs	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81

FUSES:—20 ampere capacity lighting fuse mounted on back of lighting switch. 20 ampere capacity horn fuse mounted on junction block on engine front splash shield. 7½ ampere capacity generator field fuse mounted on generator.

HORNS:—Schwartz Vibrator type horns mounted under headlights.

HUPMOBILE

SERIES 322, MODEL F (1933), SERIAL NUMBERS F-3801 UP

AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—On right side of dash under engine hood.

ENGINE NUMBER:—Stamped on left side of crankcase.

ENGINE:—Eight cylinder 'in line' 'L' head type, 3x4 $\frac{5}{8}$ " bore and stroke, 261.5 cubic inch displacement, rated at 28.8 H.P., develops 96 H.P. at 3600 R.P.M. Standard compression ratio 5.47-1. No optional ratios offered.

BATTERY:—Willard, Type WH-2-15, 6 volt, 15 plate, 119 ampere hour capacity (20 hour rate). Starting capacity 140 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—Battery mounted on left frame member under driver's seat.

Dimensions:—Width, 7 1/16". Length, 10 5/16". Height, 9 5/16".

IGNITION:—Coil Model CE-4402. Coil mounted on left hand side of engine

Ignition Current:—1-3 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped).

Ignition Switch:—Electrolock, Type 5-B. Assembled as unit with coil (see Equipment Section for complete data).

Distributor Model IGH-4021-A. Two-breaker, 4-lobe cam, semi-automatic advance type. Breaker contacts open alternately at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Timing). Manual advance controlled by button at lower right of instrument panel. Pulling out spark control button retards spark. Maximum manual advance (with button pushed in) is 26° (engine).

Breaker Gap:—Set contact gaps at .020-.022".

Breaker Arm Spring Tension:—16-20 ounces measured at tip of breaker arm with spring scale at right angles to back of arm.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start	400	800		
4	2	765	1530		
8	4	1140	2280		
12	6	1510	3020		
13	6½	1600	3200		

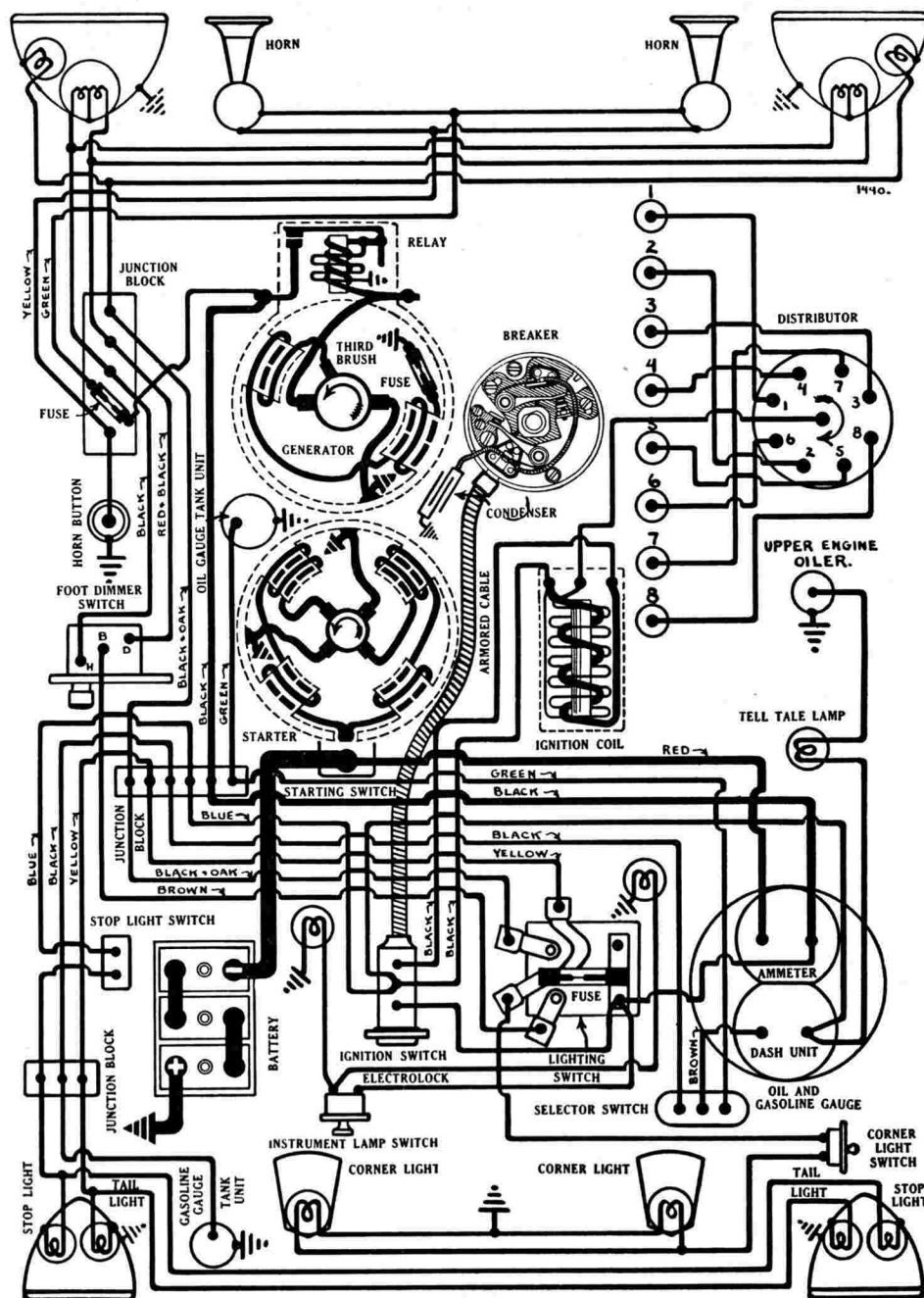
Mounting:—Distributor mounted on right hand side of cylinder head. Electrolock must be removed as unit with distributor (see Equipment Section for complete instructions on removing Electrolock from distributor). To remove distributor, disconnect all wiring on Electrolock and free Electrolock from dash, disconnect manual spark control, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler on distributor. Take off distributor cap and rotor, put one drop oil on breaker arm pivot pins, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard Setting 9° or 15/16" (flywheel), .0355 (piston travel) before top dead center with manual spark control advanced.

To Set Ignition Timing:—First advance manual spark control (push button in toward dash) and see that distributor is rotated counter-clockwise to limit of advance arm slot, take off cover over inspection hole in top of flywheel housing at right of engine. With No. 8 piston on compression stroke, turn engine over by hand until piston reaches firing position with ignition mark '/' on the flywheel in the exact center of the inspection hole. This mark is 9° or 15/16" before the top dead center mark '1 o 8'. Then loosen clamp bolt in advance arm, rotate distributor until first or 'fixed' set of contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt, see that rotor is directly opposite No. 8 segment in distributor cap (see diagram), connect spark plugs as indicated. Distributor must then be synchronized to complete timing operation.

Synchronization of Contacts. No flywheel mark is provided for advanced timing point for cylinder No. 5 but a mark can be made on flywheel 15/16" before top dead center mark '4 o 5' for synchronization. After fixed contacts have been timed to engine (above), turn crankshaft 90° or ¼ revolution to



HUPMOBILE

SERIES 322, MODEL F (1933), SERIAL NUMBERS F-8801 UP
AUTO-LITE SYSTEM

firing position of piston No. 5 with flywheel mark '405' 15/16" before this point (manual spark control advanced). Then loosen lock screws on movable sub-plate (carrying second set of contacts), shift plate until contacts begin to open, tighten lock screws, check contact gap.

Synchronization of Contacts—Second Method. Use special Auto-Lite synchronizing tool and follow complete directions in Equipment Section.

Firing Order:—1-4-7-3-8-5-2-6. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set gaps at .026-.030".

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is driven by two-sprocket non-adjustable chain drive from crankshaft. Sprockets are marked. To set timing, with crankshaft turned so that pistons Nos. 1 and 8 are on top dead center and with camshaft turned so that No. 1 intake and exhaust valves are closed with .020" (intake), .026" (exhaust) tappet clearance, mesh chain so that there are nine open links or ten pins between marks on sprockets (begin count with pin in line with tooth meshed opposite mark on crankshaft sprocket and mesh tooth in line with the tenth pin opposite mark on camshaft sprocket).

To Check Valve Timing. With No. 1 piston on top dead center entering power stroke, set tappet clearance of No. 1 valves at .020" (intake), .026" (exhaust). Turn engine over one complete revolution and stop with piston on top dead center with flywheel mark '108' in center of inspection hole in flywheel housing. Both No. 1 valves should be closed at this point. Reset tappet clearance at .018" (intake and exhaust) with engine warm.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1.494-1.504"	.3405-.3415"	45°	11/32"
Exhaust	1.338-1.348"	.3405-.3415"	45°	11/32"
	Operating	Tappet Clearance	Timing	
Intake	.018" (hot)	.020" opening side)	.026" closing side)	
Exhaust	.018" (hot)	.020" opening side)	.026" closing side)	

Valve Springs

8 Coil Spring—Closed—16-20 pounds—2 1/4". Open—42-46 pounds—1 29/32"

5 1/2 Coil Spring—Closed—17-21 pounds—2 1/4". Open—44-48 pounds—1 29/32"

Intake Valves

Valve Timing

Exhaust Valves

Open—at top dead center. Open—40° before lower dead center.
Close—40° after lower dead center. Close—At top dead center.

CARBURETION:—Stromberg Updraft Carburetor, Model UUR-2 (see Carburetor Section for complete data). Manifold heat control and choke control operated manually by buttons on instrument panel.

Fuel Pump:—Stewart-Warner Mechanical type operated by eccentric on camshaft (see Equipment Section for complete data).

Gasoline and Oil Gauge:—Stewart-Warner electric combination gasoline and oil gauge (see Equipment Section). Gasoline gauge registers whenever ignition is turned 'on'. The same dial functions as an oil gauge by pulling out button at right center of instrument panel.

STARTER:—Model MAD-4118. Starter drive—Outboard Bendix with switch mounted on starter field frame and operated through flexible cable control by button at lower left of instrument panel. Starter rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces on each brush.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3750	5.5	58
.7 "	2360	5.5	100
3.0 "	1260	5.0	200
5.7 "	770	4.5	300
8.8 "	425	4.0	400
13.0 "	Lock	3.0	500
20.2 "	Lock	4.0	730

Mounting:—Sleeve mounted in front of flywheel housing at left of engine. To remove, disconnect cable and switch control, take out large pilot mounting screw in housing above starter sleeve, pull starter forward to clear Bendix housing, lift out.

Oiling:—1000 Miles. Put 5-6 drops light engine oil in oiler at drive end of armature. Commutator end bearing is oilless.

GENERATOR:—Model GAR-4317. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate 17 amperes (cold) at 8.0 volts reached at 1775 R.P.M.

Charging Rate Adjustment. Take off commutator cover band, shift third brush by prying on brush mounting stud counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	675	0	6.4	740
4	6.8	820	4	6.9	925
8	7.0	950	8	7.3	1100
12	7.4	1120	12	7.7	1420
16	7.8	1400	13.4	8.0	1875
17	8.0	1775	8.5	7.4	3200
9	7.2	3200			

Brush Spring Tension:—24-36 ounces on each brush.

Field Current:—4.75-5.25 amperes at 6.0 volts across field terminals.

Motoring:—5.0-5.65 amperes at 6.0 volts.

Field Fuse:—7 1/2 ampere capacity.

Mounting:—Flange mounted on left hand front motor support arm and driven by the fan belt. To remove, disconnect lead, loosen mounting bolts, swing generator toward engine and slip off drive belt, take out flange mounting bolts, lift generator out.

Belt Adjustment. Belt should be inspected and adjusted, if necessary, at 1000-mile intervals. To take up belt, loosen clamp bolt and pivot bolts, swing generator away from engine until correct belt tension is secured, tighten mounting bolts. Belt should be just tight enough to drive generator and fan without slipping.

Oiling:—1000 Miles. Put 5-6 drops light engine oil in oiler at each end.

RELAY:—Model CB-4011-A. Mounted on generator field frame. Contacts close at 675 R.P.M. when generator voltage reaches 7-7.5 volts with charging current of approximately 2 amperes and open with discharge current of .5-2.5 amperes.

Contact Gap:—.025-.035". **Air Gap:**—.010-.030 inch with contacts closed.

LIGHTING:—Soreng-Manegold Switch, Model D-5670-A. Dimmer Switch Model A-2100-A. Lighting switch mounted on back of instrument board and controlled by push-pull button at lower right center of instrument panel. Double filament headlight bulbs are used for 'depressed beam' dimming and are controlled by foot-operated dimmer switch on toeboard.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Parking Bulbs	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Lights	6-8	15	S.C.	87
Pillar (Corner) Lights	6-8	6	S.C.	81

FUSES:—20 ampere capacity lighting fuse mounted on back of lighting switch. 20 ampere capacity horn fuse mounted on junction block on engine front splash shield. 7 1/2 ampere capacity field fuse mounted on generator.

HORNS:—Sparton Twin horns mounted under headlights.

HUPMOBILE

MODEL 326, SERIES I (1933), SERIAL NUMBERS 1-5751 UP
AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—On plate on right hand side of dash under hood.

ENGINE NUMBER:—Stamped on left hand side of center of crankcase.

ENGINE:—Eight cylinder 'in line', 'L' head type, 3 3/16x4 1/4" bore and stroke, 303.2 cubic inch displacement, rated at 32.51 H.P., develops 109 H.P. at 3500 R.P.M. Standard compression ratio 5.35-1. No optional compression ratios are offered.

BATTERY:—Willard, Type WH-2-15, 6 volt, 15 plate, 119 ampere hour capacity (20 hour rate). Starting capacity 140 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—Battery mounted on left frame member under driver's seat.

Dimensions:—Width, 7 1/16". Length, 10 5/16". Height, 9 5/16".

IGNITION:—Coil Model CE-4402. Coil mounted on left hand side of engine

Ignition Current:—1-3 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped).

Ignition Switch:—Electrolock, Type 5-B. Assembled as unit with coil (see Equipment Section for complete data).

Distributor Model IGH-4021-A. Two-breaker, 4-lobe cam, semi-automatic advance type. Breaker contacts open alternately at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Timing). Manual advance controlled by button at lower right of instrument panel. Pulling out spark control button retards spark. Maximum manual advance (with button pushed in) is 26° (engine).

Breaker Gap:—Set contact gaps at .020-.022".

Breaker Arm Spring Tension:—16-20 ounces measured at tip of breaker arm with spring scale at right angles to back of arm.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0.....	Start.....		400.....		800
4.....	2.....		765.....		1530
8.....	4.....		1140.....		2280
12.....	6.....		1510.....		3020
13.....	6 1/2.....		1600.....		3200

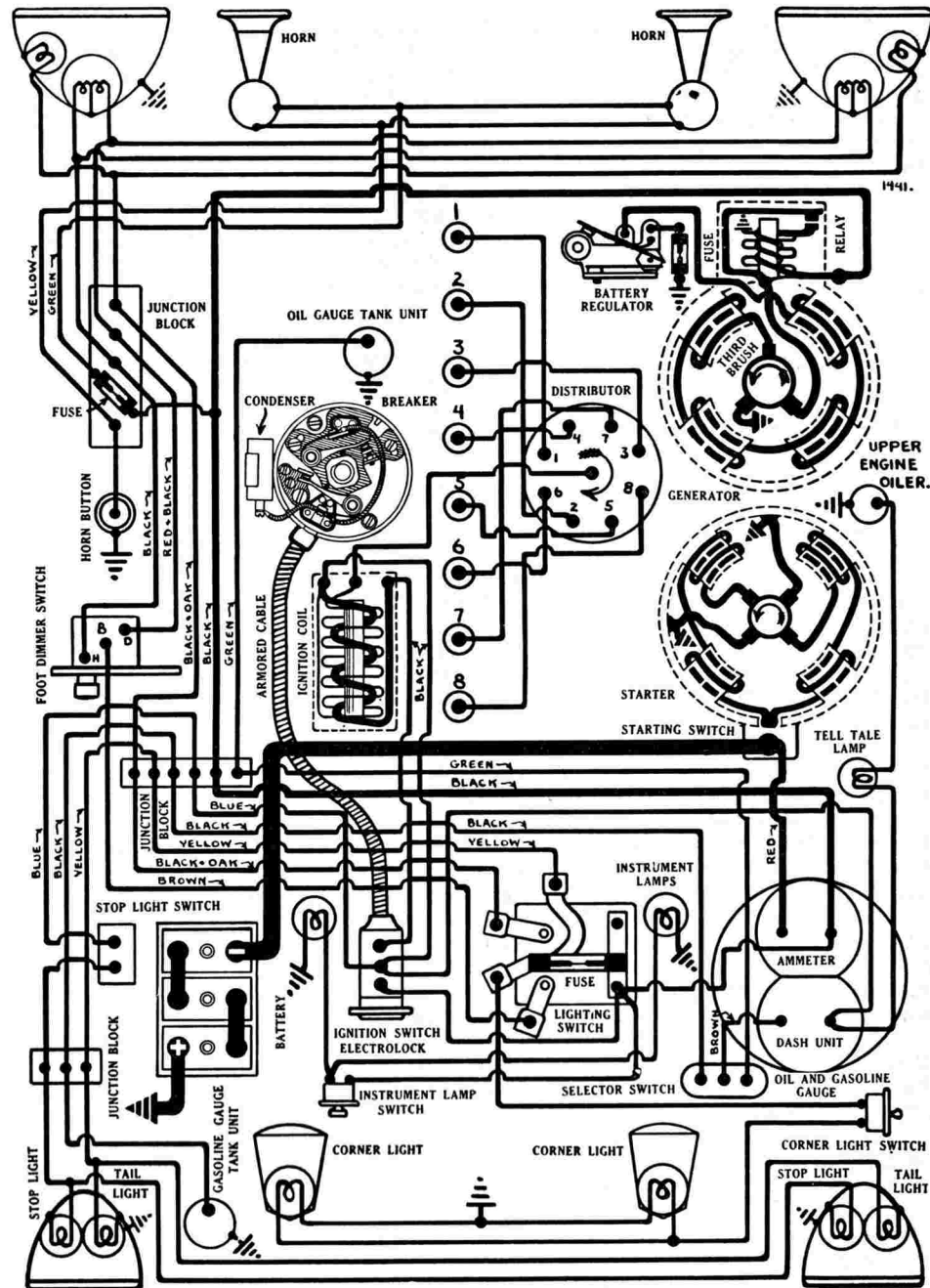
Mounting:—Distributor mounted on right hand side of cylinder head. Electrolock must be removed as unit with distributor (see Equipment Section for complete instructions on removing Electrolock from distributor). To remove distributor, disconnect all wiring on Electrolock and free Electrolock from dash, disconnect manual spark control, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler on distributor. Take off distributor cap and rotor, put one drop oil on breaker arm pivot pins, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard Setting 9° or 1" (flywheel), .0365" (piston travel before top dead center with manual spark control advanced).

To Set Ignition Timing:—First advance manual spark control (push button in toward dash) and see that distributor is rotated counter-clockwise to limit of advance arm slot, take off cover over inspection hole in top of flywheel housing at right of engine. With No. 8 piston on compression stroke, turn engine over by hand until piston reaches firing position with ignition mark '7' on the flywheel in the exact center of the inspection hole. This mark is 9° or 1" before the top dead center mark '1 o 8'. Then loosen clamp bolt in advance arm, rotate distributor until first or 'fixed' set of contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt, see that rotor is directly opposite No. 8 segment in distributor cap (see diagram), connect spark plugs as indicated. Distributor must then be synchronized to complete timing operation.

Synchronization of Contacts. No flywheel mark is provided for advanced timing point for cylinder No. 5 but a mark can be made on flywheel 1 inch before top dead center mark '4 o 5' for synchronization. After fixed contacts have been timed to engine (above), turn crankshaft 90° or 1/4 revolution to firing position of piston No. 5 with flywheel mark '4 o 5' 1" before this point (manual spark control advanced). Then loosen lock screws on movable sub-



HUPMOBILE

MODEL 326, SERIES 1 (1933), SERIAL NUMBERS 1-5751 UP

AUTO-LITE SYSTEM

plate (carrying second set of contacts), shift plate until contacts begin to open, tighten lock screws, check contact gap.

Synchronization of Contacts—Second Method. Use special Auto-Lite synchronizing tool and follow complete directions in Equipment Section.

Firing Order:—1-4-7-3-8-5-2-6. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set gaps at .026-.030".

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine is chain driven from crankshaft in tandem with generator sprocket. Sprockets are marked. To set timing, with crankshaft turned so that pistons Nos. 1 and 8 are on top dead center and camshaft turned so that No. 1 intake and exhaust valves are closed with tappet clearance of .020" (intake), .026" (exhaust), mesh chain so there are 11 links or 12 pins between marks on camshaft sprocket and crankshaft sprocket.

To Check Valve Timing. With piston No. 1 on top dead center entering power stroke set tappet clearance of No. 1 valves at .020" (intake), .026" (exhaust). Turn engine over one complete revolution and stop with piston on top dead center with flywheel mark '1-8' in exact center of inspection hole in flywheel housing. Both No. 1 valves should be closed at this point. Reset tappet clearance .018" (intake and exhaust) with engine hot.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1.526-1.536"	.3405-.3415"	45°	11/32"
Exhaust	1.401-1.411"	.3405-.3415"	45°	11/32"

Operating	Tappet Clearance	Timing
Intake	.018" (hot)	.020" (opening side) .026" (closing side)
Exhaust	.018" (hot)	.020" (opening side) .026" (closing side)

Valve Springs

8 Coil Spring:—Closed—18-22 pounds.—2 7/16". Open—44-48 pounds—2 3/32"
 5 1/2 Coil Spring:—Closed—19-21 pounds.—2 7/16". Open—46-50 pounds—2 3/32"

Intake Valves	Valve Timing	Exhaust Valves
Open—3° after top dead center.	Open—41° before lower dead center.	
Close—49° after lower dead center.	Close—5° after top dead center.	

CARBURETION:—Stromberg Updraft Carburetor, Model UUR-2 (see Carburetor Section for complete data). Manifold heat control and choke control operated manually by buttons on instrument panel.

Fuel Pump:—Stewart-Warner mechanical type operated by eccentric on camshaft (see Equipment Section for complete data). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located above bowl) before reassembling.

Gasoline and Oil Gauge:—Stewart-Warner electric combination gasoline and oil gauge (see Equipment Section). Gasoline gauge registers whenever ignition is turned 'on'. The same dial registers amount of oil in crankcase when selector button at right center of instrument panel is pulled out.

STARTER:—Model MAB-4042. Starter drive—Outboard Bendix with starting switch mounted on starter field frame and operated through flexible cable control by button at lower left of instrument panel. Starter rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4000	5.5	46
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	700	4.5	300
10.2 "	420	4.0	400
17.0 "	Lock	3.0	525
24.0 "	Lock	4.0	725

Mounting:—Sleeve mounted on forward face of flywheel housing at right of engine. To remove, disconnect cable and starting switch control, take out large pilot mounting screw in housing directly above starter sleeve, pull starter straight forward to clear Bendix housing, lift out.

Oiling:—1000 Miles. Put 5-6 drops light engine oil in oiler at drive end of ar-

mature. Commutator end bearing is oilless.

GENERATOR:—Model GAG-4138. Third brush regulation combined with Owen-Dyneto Battery Charge Regulator (see Equipment Section for data on Regulator). Generator rotation counter-clockwise at commutator end. Maximum charging rate 19 amperes (cold) at 8.0 volts reached at 1500 R.P.M.

Charging Rate Adjustment. Take off commutator band, shift third brush by prying on brush mounting stud, counterclockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	550	0	6.4	640
4	6.7	660	4	6.9	800
8	7.0	760	8	7.3	980
12	7.4	900	10	7.6	1110
16	7.8	1120	12	7.8	1280
19	8.0	1540	14.2	8.0	1680
13	7.4	2400	11.5	7.7	2400

Brush Spring Tension:—22-27 ounces on each brush.

Field Current:—3.99-4.41 amperes at 6.0 volts across field terminals.

Field Fuse:—7 1/2 ampere capacity fuse mounted in plug in relay housing.

Motoring:—5.13-5.67 amperes at 6.0 volts.

Mounting:—Flange mounted on right hand rear face of timing chain case. To remove, disconnect lead, back off chain adjusting set screw, take out flange mounting screws, lift off timing chain, pull generator out. Tie up chain and do not crank engine with generator out.

Timing Chain Adjustment. Chain should be adjusted at end of first 1000 miles and at 5000 mile intervals during the life of the car. To take up chain, back off adjustment screw locknut, loosen flange mounting screws, turn up adjusting screw until chain begins to hum with engine running at speed equivalent to 25 M.P.H., back off adjusting screw until chain runs noiselessly, tighten adjusting screw locknut and mounting screws.

Oiling:—1000 Miles. Put 5-6 drops light engine oil in commutator end oiler.

RELAY REGULATOR:—Owen-Dyneto, Model 21611. Auto-Lite No. XA-407-B. Battery Charge Regulator mounted on generator field frame (see Equipment Section for complete data). Regulator is adjusted to operate with generator voltage of 7.6-8.0 volts reducing charging rate approximately one-half. Regulator is adjusted by turning adjusting screw under lower thermostatic arm to left or counter-clockwise to increase operating voltage and to right or clockwise to decrease operating voltage. Adjusting screw accessible after taking out field fuse and fuse holder and taking off cover. Relay contacts close when generator voltage reaches 6.2-6.4 volts and open with 0-2 ampere discharge current.

Relay Contact Gap:—.015". **Air Gap:**—.010" with contacts closed.

LIGHTING:—Soreng-Manegold Switch, Model D-5670-A. Dimmer Switch Model A-2100-A. Lighting switch mounted on back of instrument board and operated by push-pull button at lower right center of instrument panel. Double filament headlight bulbs are used for 'depressed beam' dimming controlled by foot-operated switch on toeboard.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Parking Bulbs	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Lights	6-8	15	S.C.	87
Pillar (Corner) Lights	6-8	6	S.C.	81

FUSES:—20 ampere capacity lighting fuse mounted on back of lighting switch. 20 ampere capacity horn fuse mounted on junction block on engine front splash shield. 7 1/2 ampere capacity field fuse mounted in plug in relay case cover.

LA SALLE

MODEL 345-C (1933), SERIAL NUMBERS 2,000,001 UP DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—Same as engine number.

ENGINE NUMBER:—Stamped on right hand side of crankcase below water inlet.

ENGINE:—Eight cylinder 90 degree 'V', 'L' head type, $3\frac{3}{8} \times 4\frac{15}{16}$ bore and stroke, 353 cubic inch displacement, rated at 36.45 H.P., develops 115 H.P. at 3000 R.P.M. Standard compression ratio 5.4-1. Optional high compression ratio of 5.7-1 and low compression ratio of 5.2-1 are available. When installed at factory to compensate for fuel characteristics or altitude conditions the standard ignition setting is used. Standard compression pressure 104 pounds at 1000 R.P.M.

BATTERY:—Delco, Type 17-CF, 6 volt, 17 plate, 130 ampere hour capacity (20 hour rate). Starting capacity 156 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—On outside of frame under right hand front fender.

Dimensions:—Width, 7". Length, $11\frac{3}{4}$ ". Height, $9\frac{3}{8}$ ".

IGNITION:—Coil Model 528-G. Coil is mounted on dash under cowl.

Ignition Current:—5-2 amperes (engine idling), 2 amperes (engine stopped).

Ignition Switch:—Delco-Remy Dual-lock Model 426-T co-incidental ignition switch and transmission lock (see Equipment Section).

Distributor Model 662-Y. Two-breaker, 4-lobe cam, full automatic advance type. Breaker contacts open alternately at 45° intervals corresponding to the 90° firing interval of the engine. Contacts must be synchronized (see Timing).

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Engine	Degrees	Distributor	Automatic Advance	Distributor	R.P.M.	Engine
2	Start	250			500	
7.5	3.75	500			1000	
11	5.5	800			1600	

Mounting:—Distributor is mounted at front of engine between cylinder banks. Driven by gears from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out two cap screws in distributor bracket, lift distributor out.

Oiling:—1000 Miles. Use Alemite grease and gun on Alemite fitting under distributor until grease appears at relief hole above fitting. Take off distributor cap and rotor. Put light oil on breaker arm pivot pins and fill wick oiler in center of shaft. Apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting $9^\circ 12'$ (flywheel) or $.039"$ (piston) before top dead center. To set timing, remove cover plate on flywheel housing. Center distributor pointer on quadrant scale by loosening hold-down screw in pointer arm and rotating distributor cup, tighten hold-down screw. With No. 1 piston (right hand block) on compression stroke rotate crankshaft until flywheel mark 'IG/A-1' is directly opposite indicator on flywheel housing. Loosen advance arm clamp bolt, rotate distributor cup until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp). Tighten clamp bolt, connect spark plugs as indicated on diagram.

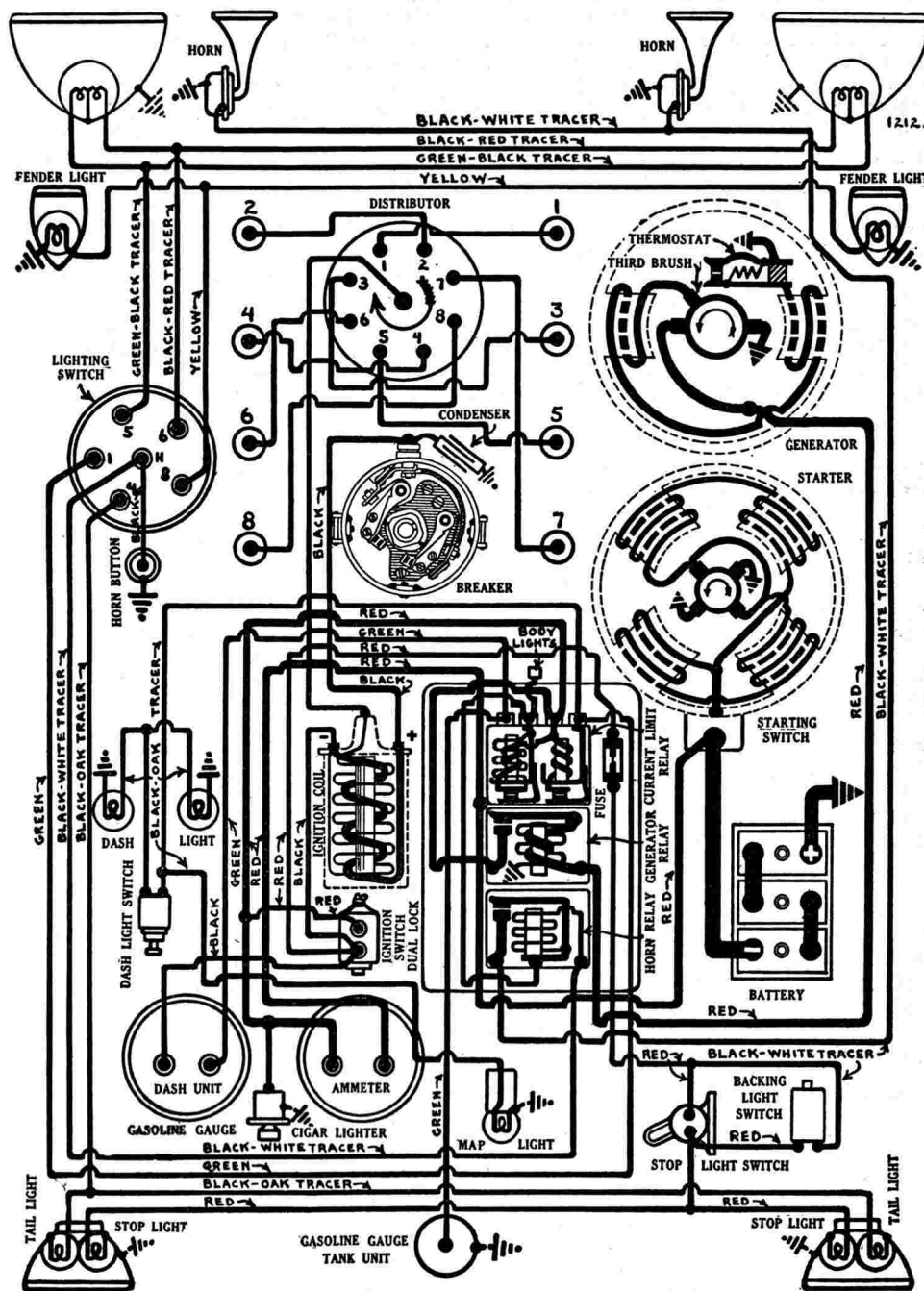
Synchronization of Contacts—first method as part of timing operation. After timing has been completed (as above), turn crankshaft 90° degrees to firing position of piston No. 2 when flywheel mark 'IG/A-2' should be opposite indicator. Loosen two lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws. Check contact gap; if outside limits of .018-.022 inch, reset at .020 inch and repeat synchronization.

Second Method—using synchronizing tool. Use Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section.

Firing Order:—1-2-7-8-4-5-6-3 with cylinders numbered as shown on diagram, or 1R-1L-4R-4L-2L-3R-3L-2R with cylinder banks right (R) and left (L) as viewed from the driver's seat. No. 1 cylinder nearest radiator in each case.

Spark Plugs:—18 MM. A.C. Type D-8. Hold gap within limits of .025-.028 inch.

VALVE TIMING:—Camshaft mounted directly above crankshaft driven by two-sprocket non-adjustable chain drive. Valves adjustable at center of engine



LA SALLE

MODEL 345-C (1933), SERIAL NUMBERS 2,000,001 UP DELCO-REMY SYSTEM

between cylinder banks. New manifold on 345-C engine requires new location of valves. With valves numbered 1 to 8, beginning at radiator, valves are #1—exhaust, #2—intake, #3—exhaust, #4 and #5—intake, #6—exhaust, #7—intake, #8—exhaust. Both cylinder blocks are identical.

To Set Valve Timing:—Camshaft sprocket and crankshaft sprocket are marked. Chain should be assembled with crankshaft and camshaft turned so that sprocket marks are directly opposite and in line with a straightedge across the shaft centers.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.660-1.666"	3/8"	6 17/32"	30°	23/64"
Exhaust	1.634-1.640"	3/8"	6 1/2"	45°	23/64"

	Tappet Clearance	Valve Springs
Intake	.004" (hot)	Closed 79 pounds (2 1/2")
Exhaust	.006" (hot)	Open 160 pounds (2.148")

Timing

Intake valves open 6 degrees before top dead center. Intake valves close 42 degrees after lower dead center. This applies with .004" tappet clearance.

Exhaust valves open 38 degrees before lower dead center. Exhaust valves close 2 degrees after top dead center. This applies with .006" tappet clearance.

CARBURETION:—Updraft type carburetor, Cadillac make (see Carburetor Section for complete data).

Fuel Pump:—A.C. mechanical type fuel pump operated by eccentric on camshaft (see Equipment Section for complete data).

Gasoline Gauge:—A.C. Electric type (see Equipment Section).

STARTER:—Model 728-P. Manual pinion engagement connected to starting switch lever (not adjustable). Starter drives through reduction gears and an overrunning clutch. Rotation (armature shaft) counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter cranks engine at 80-90 R.P.M.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
28 "	Lock	3.0	600

Mounting:—Starter flange mounted on rear face of flywheel housing at right of transmission. To remove, disconnect cable, disconnect starting pedal linkage, take out 3 flange mounting cap screws, pull starter to rear to clear housing, lift from place.

Oiling:—1000 Miles. Put 8-10 drops light oil in oiler at each end of armature shaft. Outer bearing in pinion housing is oilless.

Six Months. Take out grease plug in reduction gear case. Repack gears with graphite grease.

GENERATOR:—Model 927-S. Third brush regulation, thermostat control. Thermostat contacts open at 175°F. reducing generator output approximately 40%. Rotation is counter-clockwise at commutator end. With standard setting maximum charging rate is 14-17 amperes at 8 volts (hot) reached at 1800 R.P.M. or 22 M.P.H.

Charging Rate Adjustment:—Loosen hexagonal lock screw on endplate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Amperes	Cold Test Volts	R.P.M.	Amperes	Hot Test Volts	R.P.M.
22-24	8.6-9.0	1450-1650	14-15	7.8-8.2	1800-2000

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—3.5-4.0 amperes at 6 volts across field terminals.

Mounting:—Generator flange mounted at right of engine on rear of accessory drive chain case. Water pump mounted on front of chain case. Driven by special chain from crankshaft. To remove, drop mud pan at right of engine, disconnect lead, take off nuts on two upper flange mounting bolts, take out lower flange mounting cap screw, pull generator to rear to disengage drive coupling, take out from underneath car.

Chain Adjustment. Loosen nuts on flange mounting bolts, loosen two pivot screws (second screw on front of chain case), pull generator away from engine until chain is tight, slack off 1/8 inch, tighten bolts and screws.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler at each end of generator.

RELAY:—See paragraph on 'Apparatus Box'.

LIGHTING:—Delco-Remy Switch, Model 486-H. Lighting switch is mounted at lower end of steering column controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Position	Lamp Sizes Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Backing and Stop Light	6-8	15	S.C.	87
Map Reading Lights	6-8	3	S.C.	63
Dome and Corner Light	6-8	6	S.C.	81

NOTE:—The map reading light in the center of the instrument panel has a switch built in the socket. Switch is operated by pulling the light out against the stop. To remove map reading light bulb, pull lamp out part way until the end of the threaded shaft on the lamp plunger is flush with the end of the cylinder (behind the instrument panel), turn bulb shield until the hole in the plunger lines up with the hole in the cylinder, insert a nail to prevent plunger turning, unscrew bulb shield (right hand thread).

APPARATUS BOX:—Delco-Remy, Model 480-Z. Mounted on rear of dash under cowl. Consists of current limit relay (vibrating and lock-out circuit breaker), generator cut-out relay, horn relay, and a 10-ampere capacity fuse (in circuit to backing and stop lights).

Current Limit Relay:—Vibrating circuit breaker begins to operate with current load of 35-40 amperes limiting current to 5-20 amperes maximum with direct short-circuit. Lock-out circuit breaker begins to operate with current load of 25-30 amperes limiting current to less than 1 ampere with direct short-circuit. Circuit breaker contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring tension 5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

Cut-out Relay:—Contacts close at 8-9 M.P.H. or 420 R.P.M. (generator) with a generator voltage of 6.75-7.5 volts and open with a discharge current of 0-2 amperes. Contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

Horn Relay:—Model 266-T. Pressing horn button energizes horn relay winding, closing horn relay contacts and completing horn circuit. Horn current does not pass through horn button. Horn relay requires .25 amperes to close contacts. Horn relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

FUSES:—Stop and backing light fuse in Apparatus Box 10 ampere capacity.

HORNS:—Klaxon vibrator type matched set with blended tone, Model K-26-C Type 1379 (low note) and Model K-26-C Type 1380 (high note). Horns draw 6.0-8.5 amperes at 6 volts (Type 1379), and 5.0-6.5 amperes at 6 volts (Type 1380).

LINCOLN

MODEL V-12-136 (1933)

AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—On plate on front of dash under engine hood.

ENGINE NUMBER:—Stamped on left side of crankcase below center of cylinder block.

ENGINE:—Twelve cylinder, 67 degree 'V', 'L' head type, 3x4½" bore and stroke, 381.7 cubic inch displacement, rated at 43.2 H.P., develops 125 H.P. at 3400 R.P.M. Standard compression ratio 5.5-1.

BATTERY:—Exide, Type LX-15-21L, 6 volt, 15 plate, 148 ampere hour capacity (20 hour rate). Starting capacity 155 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—On shelf at right of transmission under front floor boards.

Dimensions:—Width, 7 1/32". Length, 15½". Height, 8 7/8".

IGNITION:—Coil Model CE-4001-L (2 used). Coils are mounted on the dash.

Stop light lead is connected to coil feed terminal.

Ignition Current:—1.45-4 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped) for each coil.

Ignition Switch:—Oakes 'Hershey' co-incidental ignition switch and steering post lock. Ignition switch used to control stop light circuit (stop light operative only with ignition turned 'on').

Distributor Model IGM-4002. Two-breaker, 6-lobe cam, semi-automatic advance type. Contacts open alternately at 33½ and 26½ degree intervals corresponding to the 67 and 53 degree alternate firing intervals of the engine. Contacts must be synchronized to secure these correct firing intervals (see Timing). Manual spark advance controlled by button at right of instrument panel. Maximum manual advance 20° (engine).

Breaker Gap:—Set contact gap at .020". Both gaps must be exactly the same.

Breaker Arm Spring Tension:—20-22 ounces.

Engine Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0.....	Start.....	300.....		600
4.....	2.....	600.....		1200
8.....	4.....	900.....		1800
12.....	6.....	1200.....		2400
16.....	8.....	1500.....		3000
20.....	10.....	1800.....		3600
23.....	11½.....	2000.....		4000

Mounting:—Distributor mounted between cylinder banks at extreme rear of engine. To remove, disconnect primary leads, disconnect manual spark control, take off distributor cap, take out two hold-down bolts in advance arm, lift distributor out.

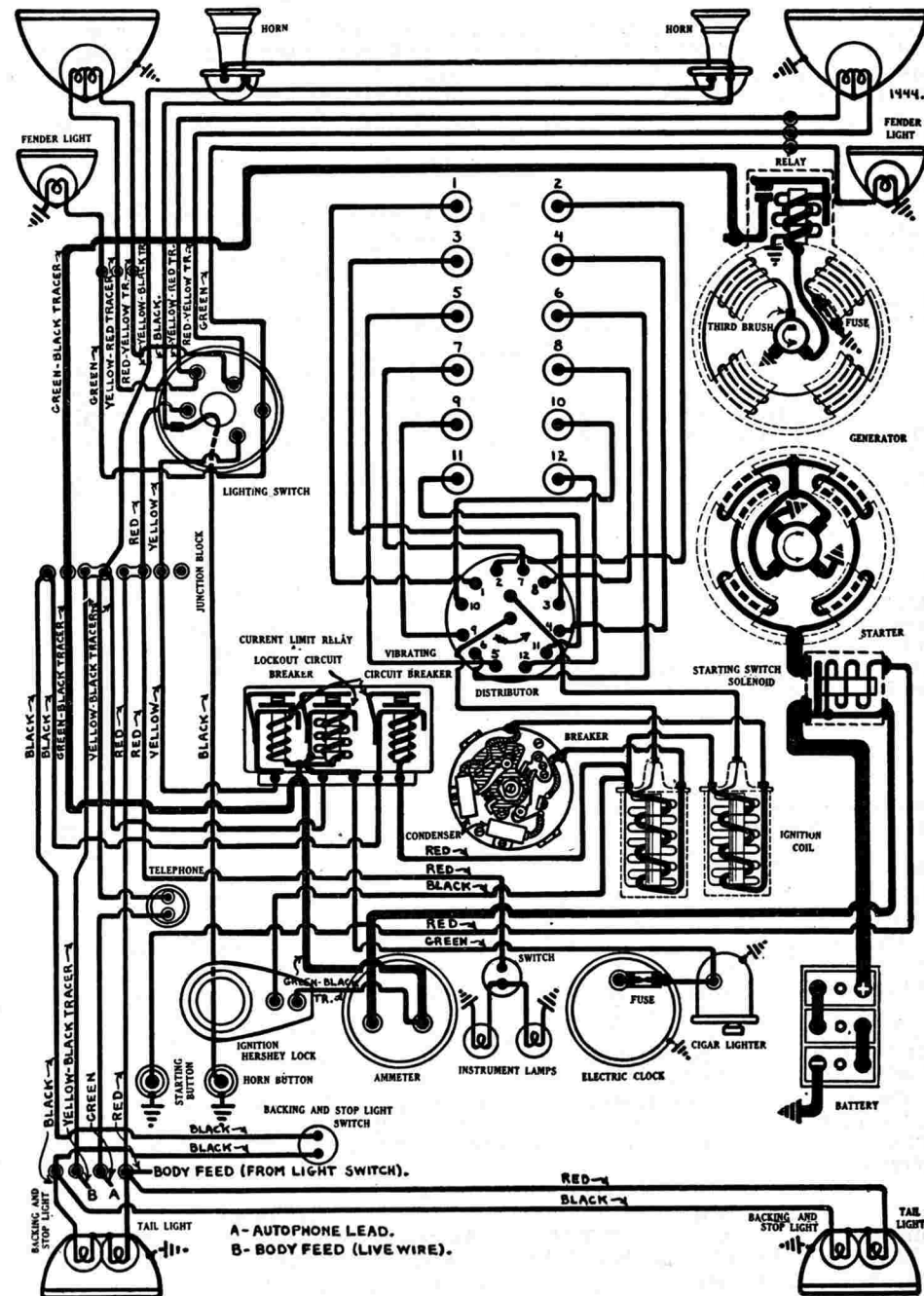
Oiling:—1000 Miles. Few drops medium engine oil in each of two oilers on side of distributor cup.

5000 Miles. Take off distributor cap and rotor, put one drop of oil on breaker arm pivot pins, apply thin film of grease to face of breaker cam.

IGNITION TIMING:—Standard setting 7° on flywheel before top dead center with manual spark control button advanced.

To Set Ignition Timing. Advance manual spark control button and see that distributor is rotated clockwise to limit of advance arm slot, take off cover plate over inspection hole in top of flywheel housing at right of engine. With No. 2 piston (No. 1 of the right hand block) on compression, turn engine over by hand until piston reaches firing position with the flywheel mark 'A/2' (which is 7° before top dead center mark 'D2/12C') directly opposite the pointer in the inspection hole. Take off distributor cap and rotor, loosen locking screw in center of breaker cam, carefully locate cam so that right hand set of contacts (fixed set mounted directly on breaker plate) are beginning to open, tighten locking screw, see that rotor terminal connected to center terminal in distributor cap is directly opposite No. 2 segment in distributor cap (see diagram), connect spark plugs as indicated. The second or 'movable' set of contacts (mounted on movable sub-plate) should then be checked for correct synchronization.

Synchronization of Contacts. Turn crankshaft 67° to firing position of



LINCOLN

MODEL V-12-136 (1933)

AUTO-LITE SYSTEM

of piston No. 1) with flywheel mark 'A/1' (which is 7° before top dead center mark 'D-1/11C') directly opposite pointer in inspection hole in flywheel housing. Then loosen lock screws on movable sub-plate, turn eccentric adjusting screw until the left hand or 'movable' contacts begin to open, tighten lock screws, recheck contact gap. This operation will secure the correct 33½° interval between the opening of the first or 'fixed' set and the second or 'movable' set of contacts. The first set of contacts will open again after 26½° of distributor shaft rotation, or 53° on the crankshaft.

Firing Order:—1-4-9-8-5-2-11-10-3-6-7-12 with cylinders numbered as indicated on the diagram, or 1L-2R-5L-4R-3L-1R-6L-5R-2L-3R-4L-6R with cylinder banks right (R) and left (L) as viewed from the driver's seat and No. 1 cylinder nearest radiator. See diagram for correct connection of spark plug cables.

Spark Plugs:—⅞-18 S.A.E. Champion Type S-4. Set plug gaps at .025-.030".

VALVE TIMING:—Camshaft Setting. Camshaft is mounted directly above crankshaft between cylinder banks and is driven from the crankshaft by a chain drive in tandem with the generator drive sprocket. Automatic chain adjustment is provided for by means of an automatic idler sprocket take-up.

Valve Specifications

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 11/16"	5/16"	6¼"	45°	5/16"
Exhaust	1 11/16"	5/16"	6¼"	45°	5/16"

Tappet Clearance

Intake	.003" (cold).
Exhaust	.005" (cold).

Valve Springs

Valves closed.....70-75 pounds.

Intake Valves

Timing

Exhaust Valves

Open—21° before top dead center. Open—57° before lower dead center.
Close—47° after lower dead center. Close—11° after top dead center.

CARBURETION:—Stromberg Dual Downdraft Carburetor, Model EE-22 (see Carburetor Section for complete data). Choke is controlled manually by button on instrument panel.

Air Cleaner:—Oil-wetted wire mesh type. Remove complete unit when necessary, clean by dipping air cleaner end in pan of gasoline, dry thoroughly, re-oil by dipping in engine oil, drain before reassembling.

Fuel Pump:—A.C. combination fuel pump and vacuum pump mounted on right side of crankcase at front of engine (see Equipment Section for complete data). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model MAO-4003, MAO-4004 (R.H.D.). Starter drive—Outboard Bendix. Electro-magnetic starting switch is mounted on starter field frame and is controlled by push-button starting switch on instrument board. Starter switch is Part No. K-3652-B. Starter rotation is counter-clockwise at commutator end.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2800	5.8	50
1.5 "	1380	5.5	100
5.75 "	750	5.0	200
11.2 "	500	4.5	300
17.0 "	325	4.0	400
22.4 "	180	3.5	500
28.0 "	60	3.0	600
35.0 "	Lock	3.0	725
52.0 "	Lock	4.0	1025

Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, disconnect cable and switch lead or take off switch, take out three flange mounting screws, pull starter forward to clear Bendix housing, lift out.

armature shaft. Outboard bearing (Bendix housing) is oilless.

GENERATOR:—Model GBC-4001. Third brush regulation. Rotation is counter-clockwise at commutator end. With standard setting maximum charging rate is 20 amperes at 8.0 volts (cold) reached at 1325 R.P.M. or approximately 20 M.P.H.

Charging Rate Adjustment. Charging rate is adjusted by shifting third brush by means of an adjusting screw located on the commutator end plate. Turn the adjusting screw clockwise to increase, or counter-clockwise to decrease charging rate (third brush is moved in a direction opposite to the rotation of the adjusting screw).

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	400	0	6.4	460
4	6.9	460	4	6.7	550
8	7.0	525	8	7.1	650
12	7.3	600	12	7.4	790
16	7.5	725	16	7.8	1025
20	7.8	940	17.2	8.0	1400
22	8.0	1325	12.4	7.5	2800
13	7.3	2800			

Field Current:—2.75-3.05 amperes at 6.0 volts across field terminals.

Field Fuse:—7½-ampere capacity mounted in plug on end plate.

Motoring:—5.32-5.88 amperes at 6.0 volts.

Mounting:—Flange mounted on right hand rear face of timing chain case. Water pump is mounted on commutator end of generator and is driven by extension of generator shaft. To remove, drain radiator, disconnect hose couplings or take off water pump, take out three flange mounting screws, pull generator to rear to disengage drive coupling, lift out. Do not disturb intermediate plate carrying drive sprocket.

Oiling:—1000 Miles. Few drops medium engine oil in oiler at each end.

RELAY:—Model CB-4014-L. Mounted on generator field frame. Contacts close when generator voltage reaches 7.0-7.5 volts and open with discharge current of 5-2.5 amperes.

Contact Gap:—.025-.035". **Air Gap:**—.010-.030" with contacts closed.

LIGHTING:—Essex Wire Co. Switch. Lighting switch is mounted at lower end of steering column and is controlled by lower lever on steering wheel. Double filament bulbs are used in the headlights for 'depressed beam' dimming and are controlled by the lighting switch.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tail Lights	6-8	3	S.C.	63
Stop and Backing Lights	6-8	15	S.C.	87
Dome and Corner Lights	6-8	6	S.C.	81

CURRENT LIMIT RELAY:—Delco-Remy Model. Mounted on dash. Consists of two vibrating and one lock-out circuit breaker (see diagram for details and circuits in which each unit is connected).

Vibrating Circuit Breaker:—Begins to operate with current load of 35-40 amperes limiting load to 5-20 amperes with direct short-circuit.

Lockout Circuit Breaker:—Begins to operate with current load of 28-31.3 amperes limiting load to less than 1 ampere.

Contact Gap:—.012-.030". **Air Gap:**—.015-.025" (contacts closed).

Spring Tension:—5 ounces minimum measured at brass button with spring scale at right angles to contact arm.

CLOCK:—Waltham electric clock. A 5-ampere capacity fuse is mounted on the back of the clock.

HORNS:—Sparton twin horns mounted under headlights. Horns are Part No.

LINCOLN

TWELVE CYLINDER MODEL V-12-145 (1933)

AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—Stamped on plate on front side of dash.

ENGINE NUMBER:—Stamped on left side of crankcase below first cylinder.

ENGINE:—Twelve cylinder 65-degree 'V' type, 'L' head engine $3\frac{1}{4} \times 4\frac{1}{2}$ " bore and stroke, 448 cubic inch displacement, rated at 50.7 H.P., develops 150 H.P. at 3400 R.P.M. Standard compression ratio 5.25-1. Optional compression ratios are not offered.

BATTERY:—Exide, Type LX-15-21L, 6 volt, 15 plate, 148 ampere hour capacity (20 hour rate). Starting capacity 155 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—In cradle on right hand side of frame under front floor boards.

Dimensions:—Width, 7 $\frac{1}{32}$ ". Length, 15 $\frac{1}{2}$ ". Height, 8 $\frac{3}{8}$ ".

IGNITION:—Coil Model CE-4001-L (2 used). Coils are mounted on the dash.

Ignition Current:—1.45-4 amperes at 6 volts per coil (engine running), 3-4.5 amperes at 6 volts per coil (engine stopped).

Ignition Switch:—Oakes 'Hershey' type co-incidental ignition switch and steering post lock.

Distributor Model IGM-4002. Two-breaker arm, 6-lobe cam, semi-automatic advance type. Breaker contacts open at 27 $\frac{1}{2}$ and 32 $\frac{1}{2}$ -degree intervals corresponding to the 55 and 65-degree firing intervals of the engine. Cylinder banks are set at an included angle of 65° resulting in this unequal alternate firing interval. Contacts must be synchronized (see Timing). Manual advance is controlled by button at left of instrument panel. Maximum manual advance is 20° (engine).

Breaker Gap:—Set contact gap at .020". Both gaps must be exactly the same.

Breaker Arm Spring Tension:—20-22 ounces.

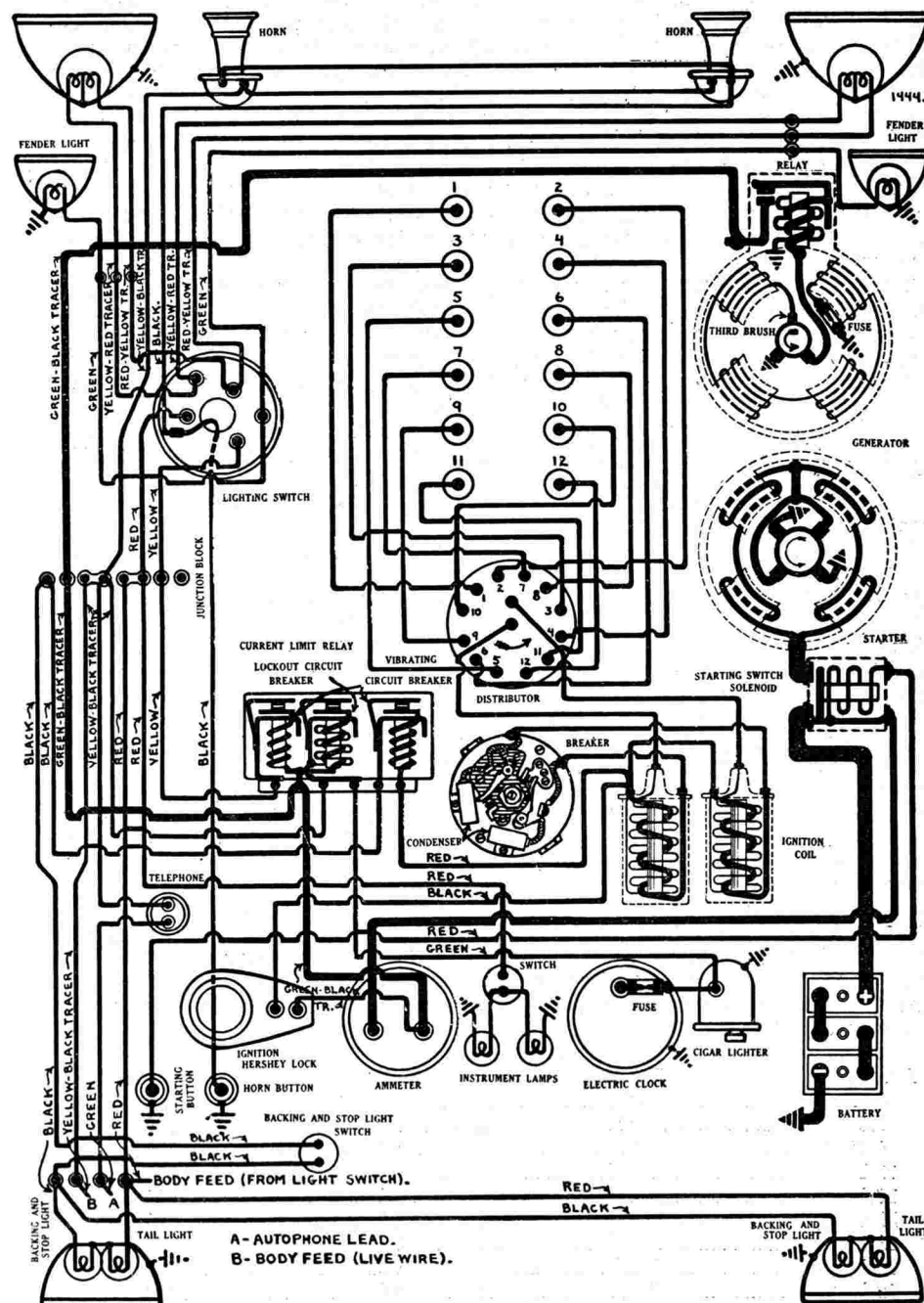
Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start	300	600		
4		600	1200		
8		900	1800		
12		1200	2400		
16		1500	3000		
20		1800	3600		
23		2000	4000		

Mounting:—Distributor mounted between cylinder banks at extreme rear of engine. To remove, disconnect primary leads, disconnect manual spark control, take off cable conduits and distributor cap, take out two hold-down screws in advance arm, lift distributor out.

Oiling:—1000 Miles. Few drops medium engine oil in two oilers on side of distributor cap.

5000 Miles. Take off distributor cap and rotor. Put one drop castor oil on breaker arm pivot pins. Apply thin film of grease to face of breaker cam.

IGNITION TIMING:—Standard setting 7° before top dead center (manual advance). To set timing, advance manual spark control, see that distributor is rotated clockwise to end of advance arm slot, take off cover plate on inspection hole in top of flywheel housing at right of engine. With piston No. 2 (No. 1 of the right hand block) on compression, turn engine over until flywheel mark 'A/2' (which is before the top dead center mark 'D2/12C') is directly under pointer on the housing, take off distributor cap and rotor, loosen locking screw in center of breaker cam, carefully locate cam so that first set of contacts (mounted directly on breaker plate) are beginning to open, tighten locking screw, connect spark plugs as indicated on diagram (No. 1 terminal as designated).



LINCOLN

TWELVE CYLINDER MODEL V-12-145 (1933)

AUTO-LITE SYSTEM

Synchronization of Contacts. After timing distributor (above) crank engine over 65 degrees to firing position of piston No. 11 (or if desired, turn engine over 1 revolution plus 65 degrees to firing position of piston No. 1) with flywheel mark 'A/1' (which is before the top dead center mark 'D1/11C') directly opposite pointer on housing. Loosen three lock screws on movable sub-plate carrying second set of contacts, turn eccentric adjusting screw until contacts begin to open, tighten lock screws. The first set or fixed contacts should open again after an interval of $27\frac{1}{2}$ degrees (distributor) or 55 degrees of crankshaft rotation.

Firing Order:—1-4-9-8-5-2-11-10-3-6-7-12 with cylinders numbered as shown on diagram, or 1L-2R-5L-4R-3L-1R-6L-5R-2L-3R-4L-6R with cylinder banks right (R) and left (L) as viewed from driver's seat. No. 1 cylinder nearest radiator in each case. See diagram for proper connection of spark plug cables on distributor cap.

Spark Plugs:— $\frac{7}{8}$ -18 S.A.E. Std. Champion Type S-2. Set plug gaps at .025-.030".

VALVE TIMING:—Valves on inner side of each cylinder bank operated by single camshaft mounted directly above crankshaft. Camshaft driven in tandem with generator sprocket by chain drive with automatic chain adjustment.

Valve Specifications

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	2"	$\frac{3}{8}$ "	6 $\frac{5}{8}$ "	45°	5/16"
Exhaust	2"	$\frac{3}{8}$ "	6 $\frac{5}{8}$ "	45°	5/16"

Tappet Clearance

Intake	.003 (cold)	Closed	75-80 pounds (2 15/16")
Exhaust	.005" (cold)	Open	175-180 pounds (2 19/32")

Spring Pressure

Intake	.003 (cold)	Closed	75-80 pounds (2 15/16")
Exhaust	.005" (cold)	Open	175-180 pounds (2 19/32")

Intake Valves

Timing

Exhaust Valves

Open—21° before top dead center.	Open—57° before lower dead center.
Close—47° after lower dead center.	Close—11° after top dead center.

CARBURETION:—Stromberg Dual Downdraft Carburetor, Model DD-3 (see Carburetor Section for complete data). Choke is operated manually by button on instrument panel.

Air Cleaner:—Oil-wetted wire mesh type integral with silencer. Remove unit when necessary, wash air cleaner by dipping in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. combination fuel pump and vacuum pump (see Equipment Section for complete data). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model MAO-4005, MAO-4006 (R.H.D.). Starter drive—Outboard Bendix drive. Rotation counter-clockwise at commutator end. Electric starting switch mounted on starter field frame controlled by button on instrument board.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2800	5.8	50
1.5 "	1380	5.5	100
5.75 "	750	5.0	200
11.2 "	500	4.5	300
17.0 "	325	4.0	400
22.4 "	180	3.5	500
28.0 "	60	3.0	600
35.0 "	Lock	3.0	725
52.0 "	Lock	4.0	1025

Mounting:—Starter flange mounted on front face of flywheel housing at right of engine. To remove, disconnect cable and switch lead or take off starting switch, take out 3 flange mounting screws, pull starter straight forward to clear Bendix housing, lift out.

Oiling:—1000 Miles. Few drops medium engine oil in oiler at each end of armature shaft. Outboard bearing (Bendix housing) is oilless.

GENERATOR:—Model GBC-4001. Third brush regulation. Rotation is counter-clockwise at the commutator end. With standard setting maximum charging rate is 20-22 amperes at 8.0 volts (cold) reached at 1325 R.P.M. or 25 M.P.H.

Charging Rate Adjustment. Charging rate is adjusted by shifting third brush. An adjusting screw is located on the commutator end plate and third brush is moved by turning this screw. Shift third brush counter-clockwise to increase or clockwise to decrease charging rate (adjusting screw should be turned clockwise to increase or counter-clockwise to decrease the charging rate).

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	400	0	6.4	460
4	6.9	460	4	6.7	550
8	7.0	525	8	7.1	650
12	7.3	600	12	7.4	790
16	7.5	725	16	7.8	1075
20	7.8	940	17.2	8.0	1400
21.6	8.0	1250	12.4	7.5	2800
13	7.3	2800			

Shunt Field Current:—2.75-3.05 amperes at 6.0 volts across field terminals.

Motoring:—5.32-5.88 amperes at 6.0 volts.

Field Fuse:— $7\frac{1}{2}$ ampere capacity fuse mounted in plug on end plate.

Mounting:—Generator flange mounted on rear face of timing chain case at right of engine. Water pump mounted on crankcase and driven by extension of generator shaft. To remove, disconnect lead, take off cover and disconnect water pump drive shaft, take out 3 flange mounting screws, pull generator to rear to disengage drive coupling (do not disturb intermediate plate carrying drive sprocket), lift out.

Oiling:—1000 Miles. Few drops medium engine oil in oiler at each end of generator.

RELAY:—Model CB-4014-L. Relay mounted on generator field frame. Contacts close with generator voltage of 7-7.5 volts and open with discharge current of 5-2.5 amperes. Contact gap limits .025-.035 inch. Air gap limits .010-.030 inch (contacts closed).

LIGHTING:—Essex Switch. Lighting switch mounted at lower end of steering column controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Fender Lights	6-8	6	S.C.	81
Instrument Lights	6-8	3	S.C.	63
Tail Lights	6-8	3	S.C.	63
Stop and Backing Lights	6-8	15	S.C.	87
Dome and Corner Lights	6-8	6	S.C.	81

CURRENT LIMIT RELAY:—Delco-Remy Model. Mounted on dash consists of two vibrating circuit breakers and one lock-out circuit breaker (in center).

Vibrating Circuit Breaker:—Begins to operate with current load of 35-40 amperes limiting load to 5-20 amperes with direct short-circuit.

Lock-out Circuit Breaker:—Begins to operate with current load of 28-31.3 amperes limiting load to less than 1 ampere with direct short-circuit.

Circuit breaker contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring tension 5 ounces minimum (measured by spring scale hooked under contact arm and at right angles to arm).

CLOCK:—Waltham Electric type. Five ampere capacity fuse mounted on back of clock.

HORNS:—Sparton twin horns mounted under headlights. Horns are Part No. A3F2.

MARMON

SIXTEEN CYLINDER MODEL (1933)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

ENGINE:—Sixteen cylinder 45 degree 'V', 'I' or overhead valve type, 3 1/8"x4" bore and stroke, 490.8 cubic inch displacement, rated at 62.5 H.P., develops 200 H.P. at 3400 R.P.M. Standard compression ratio 5.75-1. Optional compression ratios are not offered.

BATTERY:—Exide, Type 3-XCH-21-1, 6 volt, 21 plate, 167 ampere hour capacity (20 hour rate). Starting capacity 190 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded.

Mounting:—On left hand side of frame under front floor boards.

Dimensions:—Width, 7". Length, 13 9/16". Height, 9 5/16".

IGNITION:—Coil Models 528-A and 533-S. Coil Model 533-S (see 'A' on diagram) has an ignition switch built in the base. The Model 528-A coil (see 'B' on the diagram) is a standard ignition coil and is controlled by the ignition switch built in the 'A' coil. The primary lead for the 'B' coil is taken from the accessory terminal on the 'A' coil. Coils are mounted on the back of the instrument board.

Distributor Model 4084. Two-breaker, 8-lobe cam, semi-automatic advance type. Contacts open alternately at 22 1/2° intervals corresponding to the 45° firing intervals of the engine. Contacts must be synchronized (see Timing).

Manual Advance:—15° (engine) maximum.

Breaker Gap:—Set contact gap at .015". Hold within limits of .015-.020".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

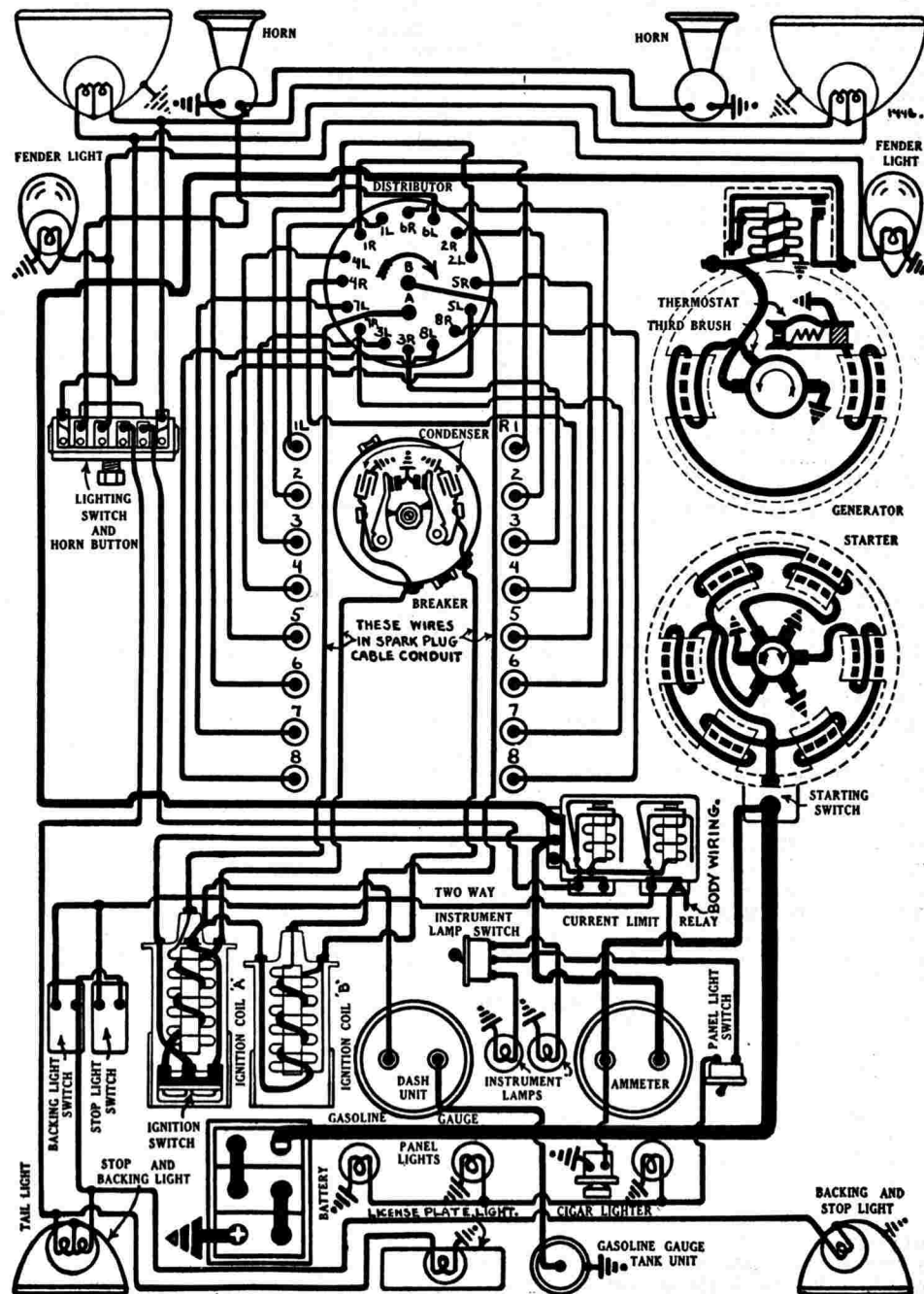
Engine	Degrees	Automatic Advance	R.P.M.
0	Start	Distributor	Engine
32	16	300	600
		1900	3800

Mounting:—Distributor is mounted between the cylinder banks at the front of the engine. To remove distributor, disconnect primary leads and manual advance control and take off cable conduits and distributor cap. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft with medium cup grease and turn down one turn every month or each 1000 miles. Every 1000 miles put 8-10 drops of light engine oil in the upper oiler and remove the distributor cap and rotor and oil the breaker arm pivot and put a small bit of vaseline on the face of the breaker cam.

IGNITION TIMING:—Standard setting 6°12' or 2 teeth on flywheel before top dead center with manual spark control fully advanced. To set timing, advance manual spark control and see that distributor is rotated counter-clockwise to end of advance arm slot, take off cover over inspection hole in flywheel housing at right of engine, turn engine over (using starter) until No. 1L piston (No. 1 of the left hand bank) is approaching top dead center on compression stroke. Then turn engine over slowly (using a large screwdriver to pry wheel around) until flywheel mark 'IGN/L1' (which is two teeth before the top dead center mark 'TDC/L1') is directly under the pointer in the inspection hole. Then loosen taper lock screw in center of breaker cam and carefully locate cam so that left hand breaker contacts (stationary set mounted directly on breaker plate) are beginning to open, tighten locking screw. Use a test lamp to determine contact opening. The left hand contacts control coil 'A' and fire spark plugs in left hand cylinder block. Ignition is set for right hand block by synchronizing contacts.

Synchronization of Contacts. After setting left hand contacts (above), turn engine over 315 degrees or 7/8 revolution to firing position of No. 1R cylinder (No. 1 of the right hand bank) with the flywheel mark 'IGN/R1' (which is two teeth before the top dead center mark 'TDC/R1') directly under the pointer in the inspection hole. Then loosen lock screws on movable breaker sub-plate (on which right hand contacts are mounted) and



MARMON

SIXTEEN CYLINDER MODEL (1933)

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

turn eccentric adjusting screw until contacts begin to open, tighten lock screws. Use a test lamp to determine contact opening. The right hand contacts control coil 'B' and fire spark plugs in right hand cylinder block. Check contact gap after synchronizing contacts. If outside limits of .015-.020 inch, reset at .018 inch and repeat synchronization.

Firing Order:—Cylinder banks are designated right (R) and left (L) as viewed from the driver's seat. No. 1 cylinder of each bank is nearest the radiator. Firing order is 1L-3R-6L-7R-2L-4R-5L-1R-8L-6R-3L-2R-7L-5R-4L-8R.

Spark Plugs:—18 MM. Metric. Champion Type 8-S. Use Type C-7 for replacement. Set gaps at .021-.022 inch.

VALVE TIMING:—**Camshaft Setting.** Turn crankshaft so that No. 3L piston is approximately on top dead center with flywheel mark 'EX.OP/1-R' at indicator in inspection hole. With tappet clearance of .014 inch, turn crankshaft in direction of rotation until No. 1R exhaust valve is about to open. With camshaft and crankshaft in this position, the marks '0/0' on camshaft and crankshaft sprockets should be directly opposite and in line with a straight-edge laid across the shaft centers. Whenever the chain case cover is removed care should be taken not to lose the spring and thrust button which holds the generator drive coupling in place.

To Check Valve Timing. The exhaust opening point of cylinders Nos. 1R and 1L are marked on the flywheel and should be used for checking the valves. The flywheel mark 'EX.OP./1R', which is the exhaust opening point for cylinder No. 1R, is 140 degrees after the top dead center mark 'T.D.C./R1'. The exhaust opening mark for cylinder No. 1L, 'EX.OP./1L', is 140 degrees after the top dead center mark 'T.D.C./L1', or 45 degrees after the exhaust opening mark for No. 1R. To check valve timing, set tappet clearance No. 1R exhaust valve at .014 inch, turn engine over to approximately firing position of No. 3L cylinder and stop with flywheel mark 'EX.OP/1-R' directly under pointer in inspection hole in right side of flywheel housing. No. 1R exhaust valve should open at this point.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 9/16"	.3095"	5 37/64"	45°	.21/64"
Exhaust	1 3/8"	.3085"	5 37/64"	45°	.21/64"

Tappet Clearance

	Operating	Timing	Closed—35 pounds (outer spring)	Spring Pressure
Intake	.008" (hot)			30 pounds (inner spring)
Exhaust	.008" (hot)	.014 (cold)	Open—120 pounds	
Intake Valves		Timing	Exhaust Valves	
Open—6° before top dead center.			Open—40° before lower dead center.	
Close—40° after lower dead center.			Close—6° after top dead center.	

NOTE:—Double valve springs are used. Coils of inner springs are wrapped in an opposite direction. Cylinder head is counter-bored for valve spring seat and a steel washer used to protect the aluminum head.

CARBURETION:—Stromberg Dual Downdraft Carburetor, Model DDR-3 (see Carburetor Section for complete data).

Fuel Pump:—A.C. Mechanical type mounted on left hand side of crankcase and driven by eccentric on camshaft (see Equipment Section for complete data).

Gasoline Gauge:—A.C. Electric type (see Equipment Section for complete data).

STARTER:—Model 489. Starter is connected to the engine through a manual pinion shift interconnected with the starting switch pedal. Rotation is clockwise at commutator end. Brush spring tension should be 2 1/4-2 1/2 pounds.

Starter Data

Torque	R.P.M.	Volts	Amperes
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Mounting:—Starter is flange mounted on the rear face of the flywheel housing at right of the engine. To remove starter, take up front floor boards disconnect cable and starting pedal linkage and remove three flange mounting screws. Pull starter to the rear to clear drive pinion and lift from place.

Oiling:—Starter bearings are oilless. They require no attention.

GENERATOR:—Model 927-N. Third brush regulation. Rotation is counter-clockwise at commutator end. Maximum charging rate is 10-13 amperes at 7.5 volts (hot) reached at 1600 R.P.M. or 38 M.P.H.

Charging Rate Adjustment. Loosen small round lock screw on endplate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.2-8.62	1400	10-13	7.3-7.7	1600

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—1.8-2.3 amperes at 6 volts across field terminals.

Motoring:—Approximately 5-6 amperes at 6 volts.

Mounting:—Generator is flange mounted at right of engine on rear face of timing chain case. The water pump is driven by an extension of the generator shaft. To remove the generator, disconnect lead and water pump drive coupling and take out flange mounting cap screws. Then pull generator to the rear to disengage drive coupling and lift from place.

Chain Adjustment. Timing chain is adjusted by shifting the plate between the generator and the front motor support housing. To tighten the chain, loosen the three generator mounting nuts and move the plate away from the engine at the top. Hold in this position and tighten the mounting nuts.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 1000 miles of operation.

RELAY:—Model 265-B. Relay is mounted on the generator. Relay contacts close when the voltage of the generator reaches 6.75-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contacts separate .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—Pines Switch, Model A-808. Lighting switch is 'Finger Tip Control' (the starting switch feature is not used) type mounted at lower end of steering column. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	15	S.C.	87
Stop, Backing, Tail Lights	6-8	21-2	D.C.	1158
Stop-Backing Light	6-8	15	S.C.	87
Dome and Corner Lights	6-8	3	S.C.	63
License Plate Light	6-8	3	S.C.	63

NOTE:—Lamp on left hand rear fender is a combination tail and stop-backing light fitted with a double filament bulb. Lamp on right hand rear fender is a stop and backing light (see diagram).

CURRENT LIMIT RELAY:—Model 410-E. This device consists of two vibrating circuit breakers mounted on the dash. Circuit breakers begin to vibrate when the current reaches 25-30 amperes and continue limiting the current to 2-15 amperes. Circuit breaker contact gap is .012-.030 inch. Air gap is

2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 2681, 26

ENGINE NUMBER:—On plate on right hand side of crankcase at rear of engine below valve cover plate.

BATTERY:—U.S.L., Type KW-13A, 6 volt, 13 plate, 96 ampere hour capacity (20 hour rate). Starting capacity 106 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to left hand rear top cover bolt on transmission.

Mounting:—In cradle on left hand side of frame under driver's seat.

Dimension:—Width, $7\frac{1}{8}$ ". Length, $9\frac{1}{16}$ ". Height, $9\frac{1}{8}$ ".

IGNITION:—Coil Model CE-4601. Coil assembled as unit with switch by means of armored cable on primary lead.

Ignition Current:—2 amperes at 6 volts (engine running), 4 amperes at 6 volts (engine stopped).

Ignition Switch:—Electrolock, Type 16-S. Assembled as unit with coil. Switch has special terminal for Startix connection (optional equipment) and two 'on' positions. First 'on' position with key turned approximately $\frac{1}{8}$ turn to right should be used on cars with Startix to check timing or whenever automatic cranking is not desired. The second 'on' position with key turned to extreme right is regular running position with ignition on and Startix operative.

Distributor Model IGB-4081-B. Single breaker, 6-lobe cam, full automatic advance type. Breaker contact gap is adjusted by loosening lock nut on stationary contact mounting stud and turning up stud.

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.020".

Breaker Arm Spring Tension:—16-22 ounces measured at tip of breaker arm with spring scale at right angles to back of arm.

Engine	Degrees	Automatic Advance Distributor	R.P.M.	Distributor	Engine
0.....		Start.....	300.....		600
4.....		2.....	575.....		1150
8.....		4.....	860.....		1720
12.....		6.....	1140.....		2280
16.....		8.....	1420.....		2840
20.....		10.....	1700.....		3400

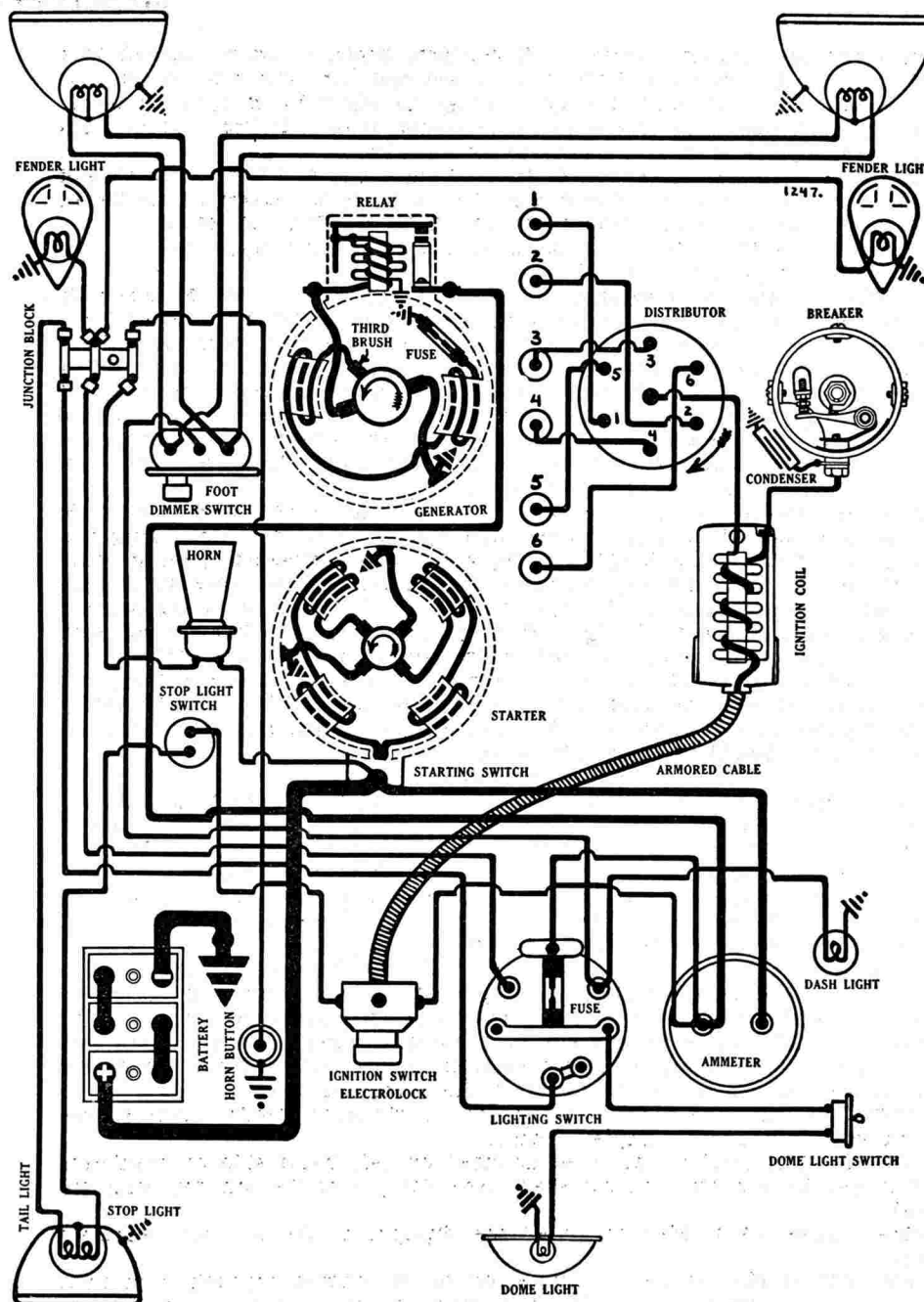
Mounting:—Distributor mounted on right hand side of cylinder head. To remove, disconnect primary lead, take off distributor cap, loosen lock nut and back out set screw in side of cylinder head opposite distributor shaft housing, lift distributor out.

Oiling:—1000 Miles. Put a few drops of light engine oil in oiler under distributor cup. Take off distributor cap and rotor, put one drop oil on breaker arm pivot pin, put 2-3 drops oil in wick oiler in center of shaft, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—With No. 1 piston on compression stroke, turn engine over by hand until the 'IGN' mark on the vibrator dampener at the front of the engine is directly under the pointer on the chain case. This 'IGN' mark is the first line on the rim of the dampener, the second line being the top dead center mark. Then loosen lock nut and back off set screw on side of cylinder head slightly, rotate distributor until contacts begin to open, tighten set screw and lock nut. See that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. A.C. Type G-10. Set gaps at .022".



NASH

BIG SIX SERIES 1120 (1933)

AUTO-LITE SYSTEM

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is driven from the crankshaft by a double diamond roller chain. Camshaft drive is two-sprocket non-adjustable type. Chain must be installed endless and sprockets are marked. To set timing, mesh sprockets so that marks are adjacent and in line with a straightedge laid across the shaft centers. Special pullers must be used to remove and install sprockets and care should be taken to keep sprockets lined up (to avoid placing side-strain on chain or sprockets) while they are being removed or installed.

Valve Specifications

	Head Diameter	Seat Angle	Width of Seat
Intake	1 21/32"	45°	1/16"
Exhaust	1 17/32"	45°	1/16"

Tappet Clearance

Intake and Exhaust008" with engine either hot or cold.

CARBURETION:—Stromberg Downdraft Carburetor, Model EX-22 (see Carburetor Section for complete data). Manifold heat control is automatic, being controlled by thermostatic spring with additional seasonal control operated manually by button on dash. Choke is controlled by button on dash.

Air Cleaner:—Oil-wetted copper mesh type integral with silencer. Remove complete unit at 3000-mile intervals, clean by dipping air cleaner end of unit in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical type mounted on right hand side of crankcase and driven by eccentric on camshaft (see Equipment Section for complete data). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model MAB-4049. Starter drive—Inboard Bendix. Starting switch is mounted on starter field frame and is operated through flexible cable control by button on instrument panel. Starter rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	46
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	700	4.5	300
10.2 "	420	4.0	400
17.0 "	Lock	3.0	525
24.0 "	Lock	4.0	725

Note on Startix:—Startix Automatic Starting Switch is optional on these cars. When Startix is installed the original starting switch is modified by disconnecting control cable and permanently blocking switch contacts closed. The cut-out relay on generator has a special terminal on the end of the case for the Startix connection (see Equipment Section for complete data and adjustments on Startix).

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect cable, disconnect starting switch control, take out flange mounting screws, pull starter forward to clear Bendix, lift out.

Oiling:—1000 Miles. Put a few drops of light engine oil in oiler at each end.

GENERATOR:—Model GAR-4205-2. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate is 17 amperes (cold) at 8.0 volts reached at 1700 R.P.M.

Charging Rate Adjustment. Take off commutator cover band, shift third brush by prying on brush mounting stud, counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction.

Generator Data—Cold Test

Amperes	Volts	R.P.M.
2	6.4	750
6	6.9	885
10	7.3	1030
14	7.65	1230
17	8.0	1700
14	7.65	2200

Brush Spring Tension:—24-36 ounces on each brush.

Field Current:—4.75-5.25 amperes at 6.0 volts across field terminals.

Field Fuse:—7.5 ampere capacity mounted under cover on top of generator.

Motoring:—5.0-5.65 amperes at 6.0 volts.

Mounting:—Cradle mounted at left front of engine with fan belt drive. Water pump is driven by extension of generator shaft. To remove generator, disconnect lead, disconnect water pump drive coupling, back off belt adjustment and slip off drive belt, loosen mounting clamp band, lift generator out.

Belt Adjustment:—To take up drive belt, loosen two cap screws on fan bracket, lift fan bracket up until sideplay on belt midway between fan and generator pulleys is about one inch when belt is pressed lightly, tighten mounting screws. Adjust belt tension whenever sideplay as measured above exceeds 1½ inches.

Oiling:—1000 Miles. Put a few drops of light engine oil in oiler at each end.

RELAY:—Model CB-4021. Mounted on generator field frame. Contacts close at approximately 750 R.P.M. of generator when generator voltage reaches 7.0-7.5 volts with charging current of approximately 2 amperes and open with discharge current of .5-2.5 amperes. Generator main brush lead is connected to terminal underneath relay case, which is connected to Startix terminal on the end of the case.

Contact Gap:—.025-.035 ". Air Gap:—.010-.030" (contacts closed).

LIGHTING:—Delco-Remy Lighting Switch, Model 478-N. Dimmer Switch Model 465-Z. Lighting switch mounted on back of instrument board and controlled by push-pull button on instrument panel. Double filament headlight bulbs are used for 'depressed beam' dimming and are controlled by foot-operated switch on toeboard. Stop and tail light is fitted with double filament bulb.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome Light	6-8	4	D.C. ....	.....

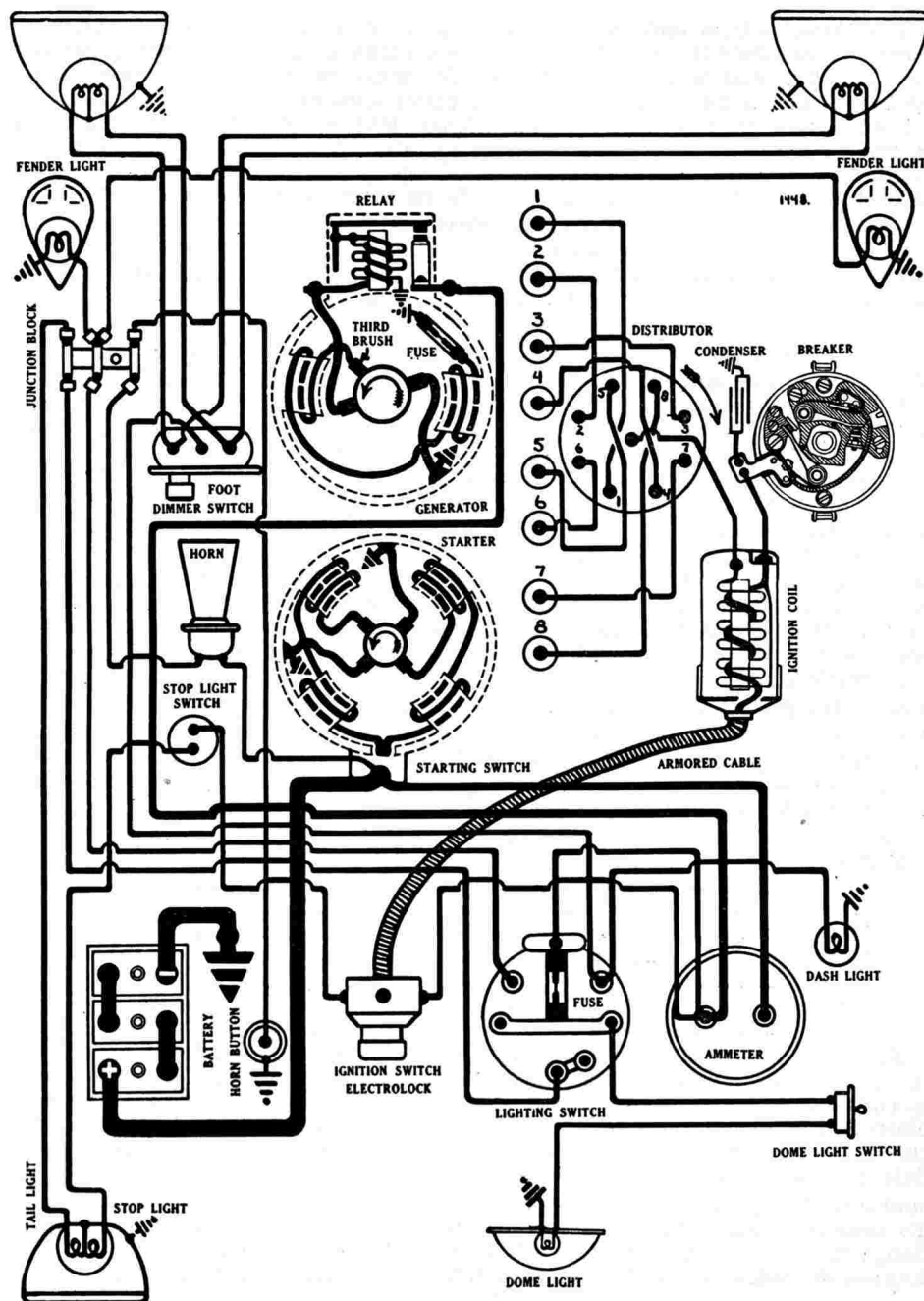
FUSES:—20 ampere capacity lighting fuse mounted on back of lighting switch.
7½ ampere capacity field fuse mounted under cover on top of generator.

AUTO-LITE SYSTEM

Breaker Arm Spring Tension:—16-20 ounces.

Engine	Degrees	Automatic Advance	R.P.M.
0.....	Distributor	Distributor	Engine
0.....	Start.....	300.....	600.....
4.....	2.....	500.....	1000.....
8.....	4.....	700.....	1400.....
12.....	6.....	900.....	1800.....
16.....	8.....	1100.....	2200.....

Synchronization of Contacts—first method. After distributor has been timed to engine (above), turn engine over 90° or ¼ revolution to firing position of piston No. 6 with the No. 6 ignition mark on the vibration dampener directly under the pointer on the chain case. Then loosen two



N A S H

STANDARD EIGHT SERIES 1130 (1933)

AUTO-LITE SYSTEM

lock screws on movable sub-plate (carrying second or 'movable' set of contacts), shift plate until contacts begin to open, tighten lock screws, check contact gap.

Synchronization of Contacts—second method. Use special Auto-Lite synchronizing tool and follow complete directions for synchronization of Type IGH distributors as given in Equipment Section.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. A.C. Type G-10. Set gaps at .022 inch.

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine is driven from the crankshaft by a double diamond roller chain. Camshaft drive is of two-sprocket non-adjustable type. Sprockets are marked and chain must be installed endless. To set timing, mesh sprockets in chain so that marks are adjacent and in line with a straightedge laid across the shaft centers. Special pullers must be used to remove and install sprockets and care must be used to keep sprockets lined up (to avoid placing side-strain on chain and sprockets) while they are being removed or installed.

Valve Specifications

	Head Diameter	Seat Angle	Width of Seat
Intake	1 13/32"	45°	1/16"
Exhaust	1 11/32"	45°	1/16"

Tappet Clearance

Intake and Exhaust008" with engine either hot or cold.

CARBURETION:—Stromberg Downdraft Carburetor, Model EX-22 (see Carburetor Section for complete data). Manifold heat control is automatic, being controlled by thermostatic spring with additional seasonal control operated manually by button on dash. Choke is controlled by button on dash.

Air Cleaner:—Oil-wetted copper mesh type integral with silencer. Remove complete unit at 3000-mile intervals, clean by dipping air cleaner end of unit in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical type mounted on right hand side of crankcase and driven by eccentric on camshaft (see Equipment Section for complete data). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model MAB-4049. Starter drive—Inboard Bendix. Starting switch is mounted on starter field frame and is operated through flexible cable control by button on instrument panel. Starter rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	46
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	700	4.5	300
10.2 "	420	4.0	400
17.0 "	Lock	3.0	525
24.0 "	Lock	4.0	725

Note on Startix:—Startix Automatic Starting Switch is optional on these cars. When Startix is installed the original starting switch is modified by disconnecting control cable and permanently blocking switch contacts closed. The cut-out relay on generator has a special terminal on the end of the case for the Startix connection (see Equipment Section for complete data and adjustments on Startix).

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect cable, disconnect starting switch control, take out flange mounting screws, pull starter forward to clear Bendix, lift out.

Oiling:—1000 Miles. Put a few drops of light engine oil in oiler at each end.

GENERATOR:—Model GAR-4205-2. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate is 17 amperes (cold) at 8.0 volts reached at 1700 R.P.M.

Charging Rate Adjustment. Take off commutator cover band, shift third brush by prying on brush mounting stud, counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction.

Generator Data—Cold Test

Amperes	Volts	R.P.M.
2	6.4	750
6	6.9	885
10	7.3	1030
14	7.65	1230
17	8.0	1700
14	7.65	2200

Brush Spring Tension:—24-36 ounces on each brush.

Field Current:—4.75-5.25 amperes at 6.0 volts across field terminals.

Field Fuse:—7.5 ampere capacity mounted under cover on top of generator.

Motoring:—5.0-5.65 amperes at 6.0 volts.

Mounting:—Cradle mounted at left front of engine with fan belt drive. Water pump is driven by extension of generator shaft. To remove generator, disconnect lead, disconnect water pump drive coupling, back off belt adjust-ment and slip off drive belt, loosen mounting clamp band, lift generator out.

Belt Adjustment:—To take up drive belt, loosen two cap screws on fan bracket, lift fan bracket up until sideplay on belt midway between fan and generator pulleys is about one inch when belt is pressed lightly, tighten mounting screws. Adjust belt tension whenever sideplay as measured above exceeds 1½ inches.

Oiling:—1000 Miles. Put a few drops of light engine oil in oiler at each end.

RELAY:—Model CB-4021. Mounted on generator field frame. Contacts close at approximately 750 R.P.M. of generator when generator voltage reaches 7.0-7.5 volts with charging current of approximately 2 amperes and open with discharge current of 5-2.5 amperes. Generator main brush lead is connected to terminal underneath relay case, which is connected to Startix terminal on the end of the case.

Contact Gap:—.025-.035 ". **Air Gap:**—.010-.030" (contacts closed).

LIGHTING:—Delco-Remy Lighting Switch, Model 478-N. Dimmer Switch Model 465-Z. Lighting switch mounted on back of instrument board and controlled by push-pull button on instrument panel. Double filament headlight bulbs are used for 'depressed beam' dimming and are controlled by foot-operated switch on toeboard. Stop and tail light is fitted with double filament bulb.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome Light	6-8	4	D.C.	

FUSES:—20 ampere capacity lighting fuse mounted on back of lighting switch. 7½ ampere capacity field fuse mounted under cover on top of generator.

NASH

SPECIAL EIGHT SERIES 1170 (1933)

AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—On right hand frame side rail under engine hood.

ENGINE NUMBER:—On plate on right hand side of crankcase at rear of engine below valve cover plate.

ENGINE:—Eight cylinder, 'L' head type, 3x4 $\frac{3}{8}$ " bore and stroke, 247 cubic inch displacement, rated at 28.8 H.P., develops 85 H.P. at 3200 R.P.M. Standard compression ratio 5.1-1. Optional compression ratios are not offered.

BATTERY:—U.S.L., Type KW-13A, 6 volt, 13 plate, 96 ampere hour capacity (20 hour rate). Starting capacity 106 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to transmission.

Mounting:—In cradle on left hand side of frame under driver's seat.

Dimensions:—Width, 7 $\frac{1}{8}$ ". Length, 9 $\frac{1}{16}$ ". Height, 9 $\frac{1}{8}$ ".

IGNITION:—Coil Model CE-4001. Coil mounted on engine side of dash under hood.

Ignition Current:—2 amperes at 6 volts (engine running), 4 amperes at 6 volts (engine stopped).

Ignition Switch:—Oakes 'Hershey' type co-incidental ignition switch and steering post lock. On cars equipped with Startix (optional equipment), it will be necessary to disconnect and tape wire on 'IGN' terminal of Startix case when ignition is turned on to check timing or whenever automatic cranking is not desired.

Distributor Model IGH-4017-A. Two-breaker, 4-lobe cam, full automatic advance type. Contacts open alternately at 45° intervals corresponding to the 90° firing interval of the engine. Contacts must be synchronized (see Timing).

Breaker Gap:—Set contact gap at .020". Hold within limits of .020-.022".

Breaker Arm Spring Tension:—16-20 ounces.

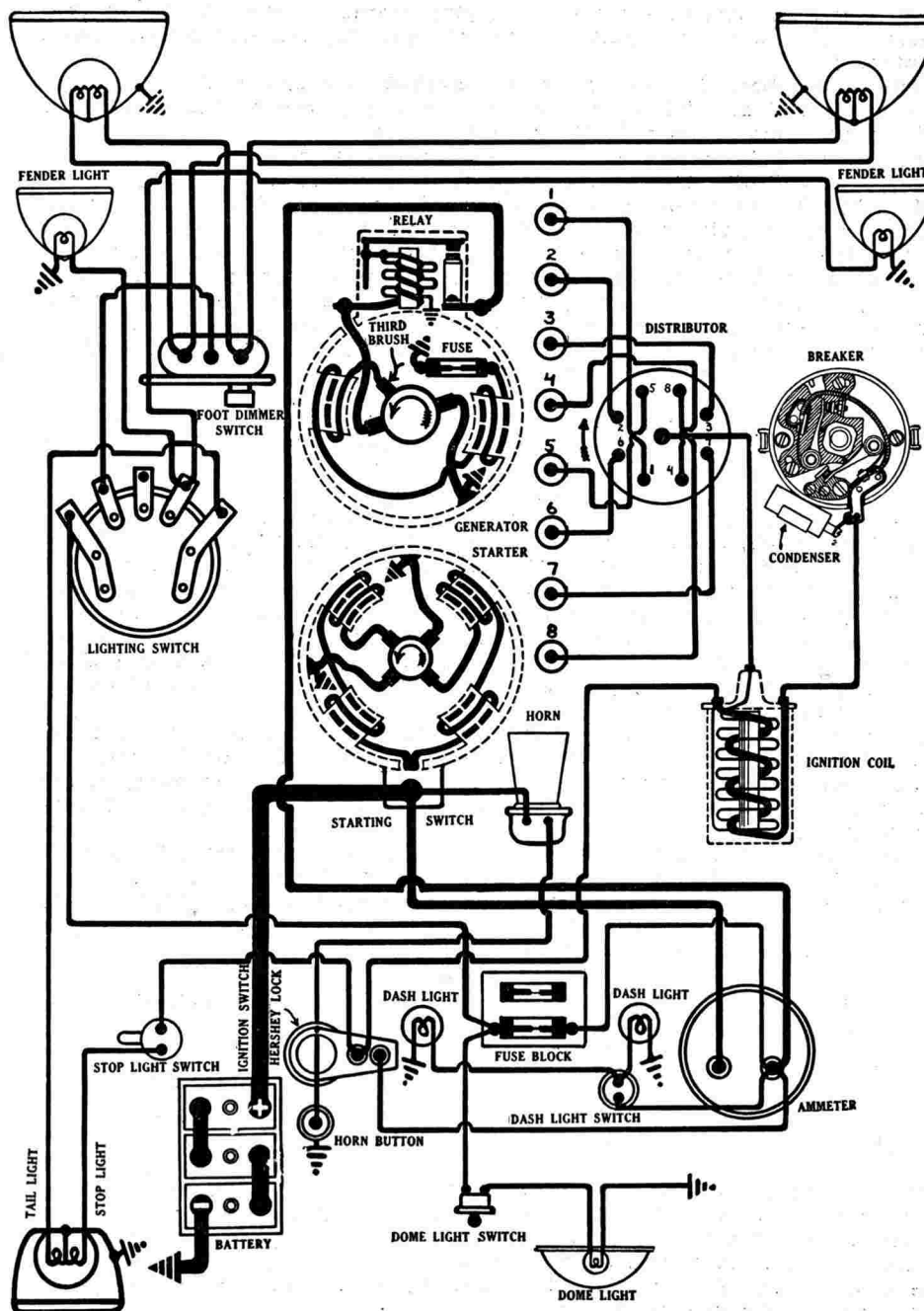
Degrees	Automatic Advance		R.P.M.
Engine	Distributor	Distributor	Engine
0.....	Start.....	300.....	600
4.....	2.....	500.....	1000
8.....	4.....	700.....	1400
12.....	6.....	900.....	1800
16.....	8.....	1100.....	2200

Mounting:—Distributor mounted on right hand side of cylinder head. To remove, disconnect breaker lead, take off distributor cap, loosen lock nut and back out set screw in side of cylinder head opposite distributor shaft, lift distributor out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler on side of distributor. Take off distributor cap and rotor, put one drop oil on breaker arm pivot pins, put 2-3 drops oil in wick oiler in center of shaft, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—With No. 1 piston on compression, turn engine over by hand until the 'IGN' mark or first line on the vibration dampener at the front of the engine is directly under the pointer on the chain case (the second line is the top dead center mark). Then loosen lock nut and back out set screw in side of cylinder head opposite distributor, rotate distributor until first or 'fixed' set of contacts (mounted directly on breaker plate) begin to open, tighten set screw and lock nut, see that rotor is directly opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated. Then synchronize contacts as directed below.

Synchronization of Contacts—first method. After distributor has been timed to engine (above), turn engine over 90° or $\frac{1}{4}$ revolution to firing position of piston No. 6 with the No. 6 ignition mark on the vibration dampener directly under the pointer on the chain case. Then loosen lock screws on movable sub-plate (carrying second or 'movable' set of contacts), shift plate until contacts begin to open, tighten lock screws, check contact gap.



NASH

SPECIAL EIGHT SERIES 1170 (1933)

AUTO-LITE SYSTEM

Synchronization of Contacts—second method. Use special Auto-Lite synchronizing tool and follow complete directions for synchronization of Type IGH distributors as given in Equipment Section.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—14 MM. Metric. A.C. Type K-12. Set gaps at .022 inch.

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine is driven from the crankshaft by a double Diamond roller chain. Camshaft drive is of the two-sprocket non-adjustable type. Sprockets are marked and chain must be removed and installed endless. To set timing, mesh sprockets in chain so that marks are adjacent and in line with a straightedge laid across the shaft centers. Special pullers must be used to remove and install sprockets and care must be used to keep sprockets lined up (to avoid placing side-strain on chain and sprockets) while they are being removed and installed.

Valve Specifications			
	Head Diameter	Seat Angle	Width of Seat
Intake	1 13/32"	45°	1/16"
Exhaust	1 11/32"	45°	1/16"

Tapet Clearance
Intake and exhaust.....008" with engine either hot or cold.

CARBURETION:—Stromberg Downdraft Carburetor, Model EE-2 (see Carburetor Section for complete data). Manifold heat control is automatic, being controlled by thermostatic spring with additional seasonal control being operated manually by button on instrument board.

Air Cleaner:—Oil-wetted copper mesh type integral with silencer. Remove complete unit at 3000-mile intervals, clean by dipping air cleaner end of unit in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. mechanical type mounted on right hand side of crankcase and driven by eccentric on camshaft (see Equipment Section for complete data). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen located directly above bowl) before reassembling.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model MAB-4026. Starter drive—Inboard Bendix. Starting switch is mounted on starter field frame and is controlled through flexible cable by button on instrument panel. Starter rotation is counter-clockwise at commutator end. Brush spring tension is 44-56 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	46
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	700	4.5	300
10.2 "	420	4.0	400
17.0 "	Lock	3.0	525
24.0 "	Lock	4.0	720

Note on Startix:—Startix automatic starting switch is optional equipment on these cars. When Startix is installed the original starting switch is modified by disconnecting control cable and permanently blocking switch contacts closed. The cut-out relay on the generator has a special terminal on the end of the case for the Startix connection. See Equipment Section for complete data on Startix.

Mounting:—Flange mounted on left hand forward face of flywheel housing.

To remove, disconnect cable and starting switch control, take out flange mounting screws, pull starter forward to clear Bendix, lift out.

Oiling:—1000 Miles. Put 5-6 drops light engine oil in oiler at each end.

GENERATOR:—Model GAL-4329. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate is 17 amperes (cold) at 8.0 volts reached at 1900 R.P.M.

Charging Rate Adjustment. Take off commutator cover band, shift third brush by prying on brush mounting stud, counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.3	600	0	6.4	700
4	6.4	740	4	6.9	900
8	7.1	900	8	7.4	1150
12	7.4	1120	10	7.7	1340
17	8.0	1900	12.4	8.0	2150
12	7.4	3200	9.5	7.7	3200

Brush Spring Tension:—8-13 ounces on each brush.

Field Current:—4.08-4.52 amperes at 6.0 volts across field terminals.

Field Fuse:—7½ ampere capacity fuse mounted on generator brush ring.

Motoring:—4.27-4.73 amperes at 6.0 volts.

Mounting:—Flange mounted on left hand rear face of engine front cross member. To remove, disconnect lead, take off drive pulley and fan belt, free brace strap at rear of generator, take out flange mounting bolts, lift generator out.

Belt Adjustment:—To take up fan belt, loosen flange mounting bolts and brace strap, swing generator away from engine until sideplay on belt mid-way between fan and generator pulleys is about one inch when belt is pressed lightly, tighten mounting bolts. Adjust belt tension whenever sideplay as measured above exceeds 1½ inches.

Oiling:—1000 Miles. Put 4-5 drops light engine oil in oiler at each end.

RELAY:—Model CB-4021. Mounted on generator field frame. Contacts close at 675 R.P.M. when generator voltage reaches 7.0-7.5 volts with charging current of approximately 2 amperes and open with discharge current of .5-2.5 amperes. Generator main brush lead is connected to terminal under relay case, which is connected to the Startix terminal on the end of the case.

Contact Gap:—.025-.035". **Air Gap:**—.010-.030" with contacts closed.

LIGHTING:—Soreng-Manegold Switch, Model 4210-A. Delco-Remy Dimmer Switch, Model 465-N. Lighting switch is mounted at lower end of steering column and is controlled by lever on steering wheel. Double filament headlight bulbs are used for 'depressed beam' dimming and are controlled by foot-operated switch on toeboard. Stop and tail light is fitted with a double filament bulb.

Lamp Sizes			
Position	Voltage	Candlepower	Base Mazda No.
Headlights	6-8	21-21	D.C. 1110
Fender Lights	6-8	3	S.C. 63
Instrument Lights	6-8	3	S.C. 63
Stop and Tail Light	6-8	21-2	D.C. 1158
Dome Light	6-8	4	S.C.

FUSES:—20 ampere capacity lighting fuse mounted on back of lighting switch. 7½ ampere capacity field fuse mounted on generator brush ring.

NASH

ADVANCED EIGHT SERIES 1180 (1933)

AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—On right hand frame side rail under engine hood.

ENGINE NUMBER:—On right hand side of crankcase near starting motor.

ENGINE:—Eight cylinder 'in line', overhead valve or 'I' head type, $3\frac{1}{8} \times 4\frac{1}{4}$ " bore and stroke, 260.8 cubic inch displacement, rated at 31.25 H.P., develops 100 H.P. at 3400 R.P.M. Standard compression ratio 5.25-1. Optional compression ratios are not offered.

BATTERY:—U.S.L., Type KW-15A, 6 volt, 15 plate, 115 ampere hour capacity (20 hour rate). Starting capacity 127 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded.

Mounting:—Under right front seat.

Dimensions:—Width, $7\frac{1}{8}$ ". Length, $10\frac{7}{32}$ ". Height, $9\frac{1}{8}$ ".

IGNITION:—Coil Model CE-4402 (2 used). Coils are mounted on engine side of dash at right of motor.

Ignition Current:—1-3 amperes at 6 volts (engine running), 3.4-5 amperes at 6 volts (engine stopped) for each coil.

Ignition Switch:—Oakes 'Hershey' type co-incidental ignition switch and steering post lock. On cars equipped with Startix (optional equipment), it will be necessary to disconnect wire on 'IGN' terminal of Startix case when ignition is turned on to check timing or whenever automatic cranking is not desired.

Distributor Model IKG-4004. Double breaker, 8-lobe cam, semi-automatic advance type. Contacts open simultaneously to fire both spark plugs in each cylinder at the same instant (each set of contacts controls one coil and fires one spark plug in each cylinder). Contacts must be synchronized (see Timing). Maximum manual advance is 20° (engine).

Breaker Gap:—Set contact gap at .015". Hold within limits of .013-.017".

Breaker Arm Spring Tension:—20 ounces measured at tip of breaker arm.

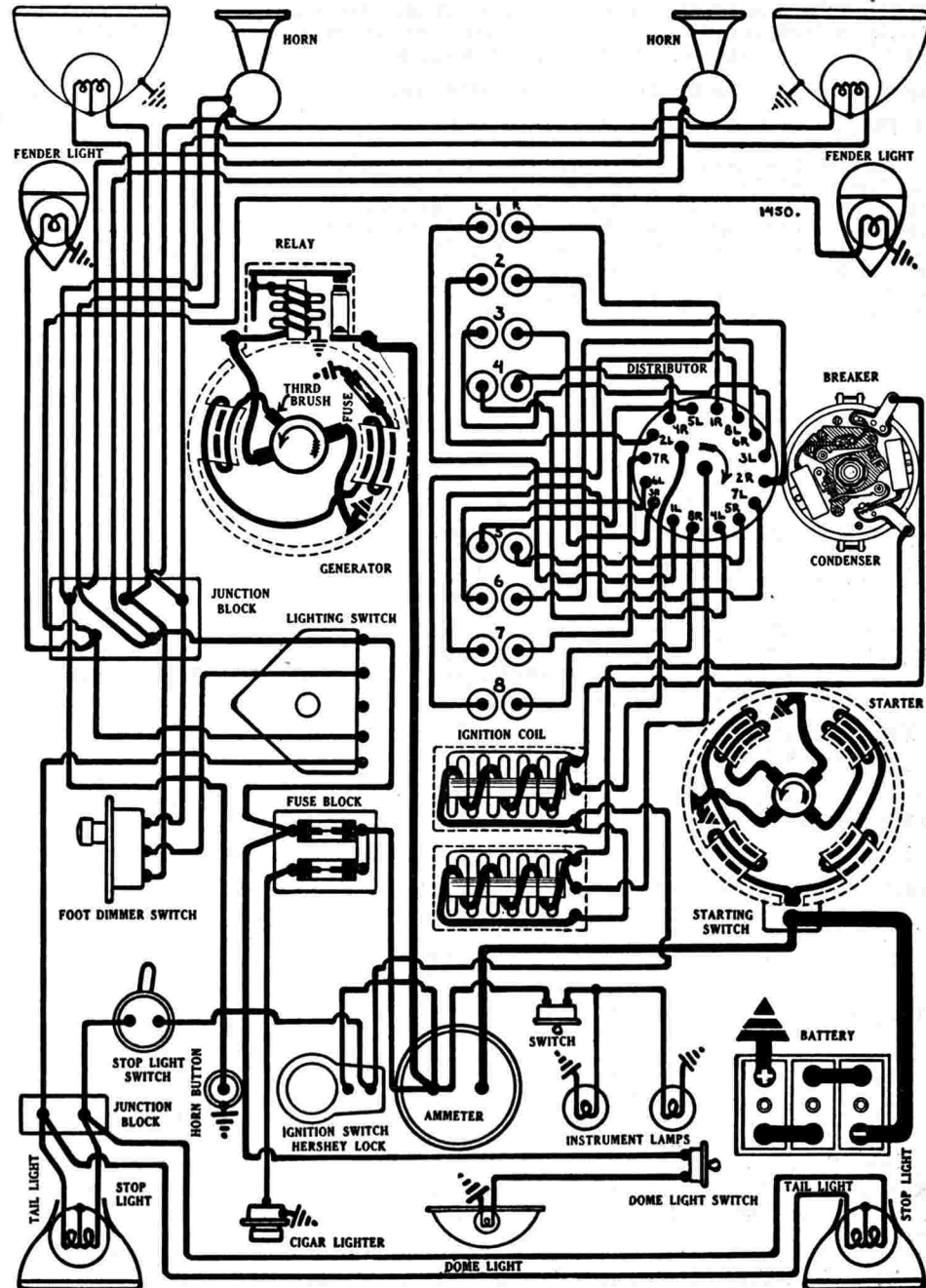
Engine	Degrees	Automatic Advance	R.P.M.	Engine
0.....	Start.....	Distributor.....	215.....	430
4.....	2.....	410.....	820	
8.....	4.....	605.....	1210	
12.....	6.....	800.....	1600	
16.....	8.....	1000.....	2000	

NOTE:—If trouble is experienced with distributor caps burning between terminals, the alignment of the rotor and distributor cap terminals should be checked. To do this it will be necessary to cut away a distributor cap so that the position of the rotor terminals with relation to the distributor cap terminals can be checked. The rotor terminals should be directly opposite the distributor cap terminals when the breaker contacts open. To correct incorrect alignment it will be necessary to elongate the two breaker plate mounting screw holes to a maximum length of $13/32$ " so that the breaker plate may be rotated within the housing to correct the alignment. If necessary the slots in the housing through which the primary terminals pass can be lengthened with a file to allow the rotation of the breaker plate. Distributors now have two lines scratched on the inside of the housing in line with the notch in the breaker plate to indicate the correct position of the plate.

Mounting:—Distributor mounted on right hand side of crankcase. To remove, disconnect primary leads and manual spark control, take off distributor cap, take out hold-down screws in advance arm, lift distributor out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler under distributor. Take off distributor cap and rotor, put one drop oil on breaker arm pivot pins, put 2-3 drops oil in wick oiler in center of shaft, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—With No. 1 piston on compression stroke turn engine over by hand until the 'IGN' mark on the vibration dampener at the front of the engine is directly under the pointer on the chain case. The 'IGN' mark is the first line on the dampener, the second line is the top dead center mark. Then loosen advance arm clamp bolt, rotate distributor until first or



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ADVANCED EIGHT SERIES 1180 (1933)

AUTO-LITE SYSTEM

fixed set of contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt, connect spark plugs as indicated on diagram.

Synchronization of Contacts—first method. After distributor has been timed to engine (above) and without disturbing position of crankshaft or distributor, loosen lock screws on movable sub-plate, shift plate until second or movable contacts (mounted on the sub-plate) begin to open, tighten lock screws. Recheck timing to make certain that both sets of contacts open at the same instant. This is important to secure full advantage of 'Twin Ignition'.

Synchronization of Contacts—second method. See complete directions on synchronization of Type IGK Distributors in Equipment Section.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—14 MM. Metric. A.C. Type K-12. Set gaps at .022 inch.

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine operates valves through pushrods and rocker arms on cylinder head. Tappet adjustment is located on rocker arms directly above pushrods. Camshaft is chain driven from the crankshaft by double Diamond roller chain. Drive is two-sprocket non-adjustable type and sprockets are marked. Chain must be installed endless and special pullers must be used to remove and install sprockets. To set timing, mesh sprockets in chain so that marks are adjacent and in line with straightedge laid across shaft centers. In removing or installing sprockets care must be taken to keep sprockets lined up so that no side-strain is placed on chain or sprockets.

Valve Specifications

	Head Diameter	Seat Angle	Width of Seat
Intake	1 21/32"	45°	1/16"
Exhaust	1 15/32"	45°	1/16"

Tappet Clearance

Intake and Exhaust......012" with engine hot and idling.

CARBURETION:—Stromberg Updraft Dual Carburetor, Model UUR-2 (see Carburetor Section for complete data). Manifold heat control and choke control are operated manually by buttons on the instrument panel.

Air Cleaner:—Oil-wetted wire mesh type. Remove complete unit at 3000-mile intervals, take off end cap (silencer), clean filter unit by dipping in pan of gasoline, dry thoroughly, re-oil by dipping in engine oil, drain before reassembling.

Fuel Pump:—A.C. combination fuel pump and vacuum pump. Remove sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model MAB-4033. Starter drive—Bendix. Starter switch mounted on starter and operated through flexible cable control by button on instrument panel. Starter rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.....	4020	5.5	46
.6 ".....	1910	5.5	100
3.4 ".....	1100	5.0	200
6.6 ".....	700	4.5	300
10.2 ".....	420	4.0	400
17.0 ".....	Lock	3.0	525
24.0 ".....	Lock	4.0	720

Note on Startix:—Startix automatic starting switch is optional equipment on these cars. When Startix is installed the original starting switch is modified by disconnecting the control cable and permanently blocking the switch contacts closed. The cut-out relay on the generator has a special terminal on the end of the case for Startix connection. See Equipment Section for complete data on Startix.

Mounting:—Flange mounted on right hand forward face of flywheel housing. To remove, disconnect cable and switch control, take out flange mounting bolts, pull starter forward to clear Bendix, lift out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler at each end.

GENERATOR:—Model GAR-4601-3. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate is 17 amperes (cold) at 8.0 volts reached at 1700 R.P.M.

Generator Data

Amperes	Volts	R.P.M.
2.....	6.4	750
6.....	6.9	885
10.....	7.3	1030
14.....	7.65	1230
17.....	8.0	1700
14.....	7.65	2200

Brush Spring Tension:—24-36 ounces on each brush.

Field Current:—4.46-4.94 amperes at 6.0 volts across field terminals.

Field Fuse:—7½ ampere capacity fuse under cover on top of generator.

Motoring:—4.89-5.41 amperes at 6 volts.

Mounting:—Cradle mounted at left front of engine with fan belt drive. Water pump is driven by extension of generator shaft. To remove, disconnect lead, disconnect water pump drive coupling, slack off belt adjustment and slip off drive belt, loosen mounting clamp band, lift generator out.

Belt Adjustment. Adjust fan belt when sideplay midway between generator and fan pulleys is more than 1½ inches when pressed lightly. To take up belt, loosen two cap screws on fan bracket, raise bracket until sideplay as measured above is about 1 inch, tighten mounting screws.

Oiling:—1000 Miles. Put 5-6 drops light engine oil in oiler at each end.

RELAY:—Model CB-4021. Mounted on generator field frame. Relay contacts close at approximately 750 R.P.M. when generator voltage reaches 7-7.5 volts with charging current of approximately 2 amperes and open with .5-2.5 ampere discharge current. Generator main brush lead is connected to terminal under relay case, which is connected to Startix terminal on the end of the case.

Contact Gap:—.025-.035". **Air Gap:**—.010-.030" with contacts closed.

LIGHTING:—Delco-Remy Lighting Switch, Model 486-C. Dimmer Switch Model 465-P. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Double filament headlight bulbs are used for 'depressed beam' dimming and are controlled by foot-operated switch on toeboard. Stop and tail lights are fitted with double filament bulbs.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome Light	6-8	4	D.C.	

FUSES:—Two 20 ampere capacity lighting fuses mounted on fuse block on engine side of dash. 7½ ampere capacity field fuse mounted on top of generator field frame.

NASH

AMBASSADOR EIGHT SERIES 1190 (1933)

AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—On right hand frame side rail under engine hood.

ENGINE NUMBER:—On plate on right hand side of flywheel housing behind starter.

ENGINE:—Eight cylinder 'in line', overhead valve or 'I' head type, $3\frac{3}{8} \times 4\frac{1}{2}$ bore and stroke, 322 cubic inch displacement, rated at 36.45 H.P., develops 125 H.P. at 3600 R.P.M. Standard compression ratio 5.25-1. Optional compression ratios are not offered.

BATTERY:—Exide, Type 3-MXC-17-1N, 6 volt, 17 plate, 133 ampere hour capacity (5 ampere rate). Starting capacity 152 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded.

Mounting:—Under right hand front seat.

Dimensions:—Width, $7\frac{1}{8}$ ". Length, $11\frac{7}{8}$ ". Height, $9\frac{9}{32}$ ".

IGNITION:—Coil Model CE-4402 (2 used). Coils are mounted on engine side of dash on right hand side.

Ignition Current:—1-3 amperes at 6 volts (engine running), 3.4-5 amperes at 6 volts (engine stopped) for each coil.

Ignition Switch:—Delco-Remy Dual-lock Model 425-S. Co-incident ignition switch and transmission lock. On cars equipped with Startix (optional equipment) it will be necessary to disconnect wire on 'IGN' terminal on Startix case when ignition is turned on to check timing or whenever automatic cranking is not desired.

Distributor Model IKG-4001, IKG-4002 (R.H.D.). Double breaker, 8-lobe cam, semi-automatic advance type. Contacts open simultaneously to fire both spark plugs in each cylinder at the same instant (each set of contacts controls one coil and fires one spark plug in each cylinder). Contacts must be synchronized (see Timing). Maximum manual advance 38° (engine).

Breaker Gap:—Set contact gap at .015". Hold within limits of .013-.017".

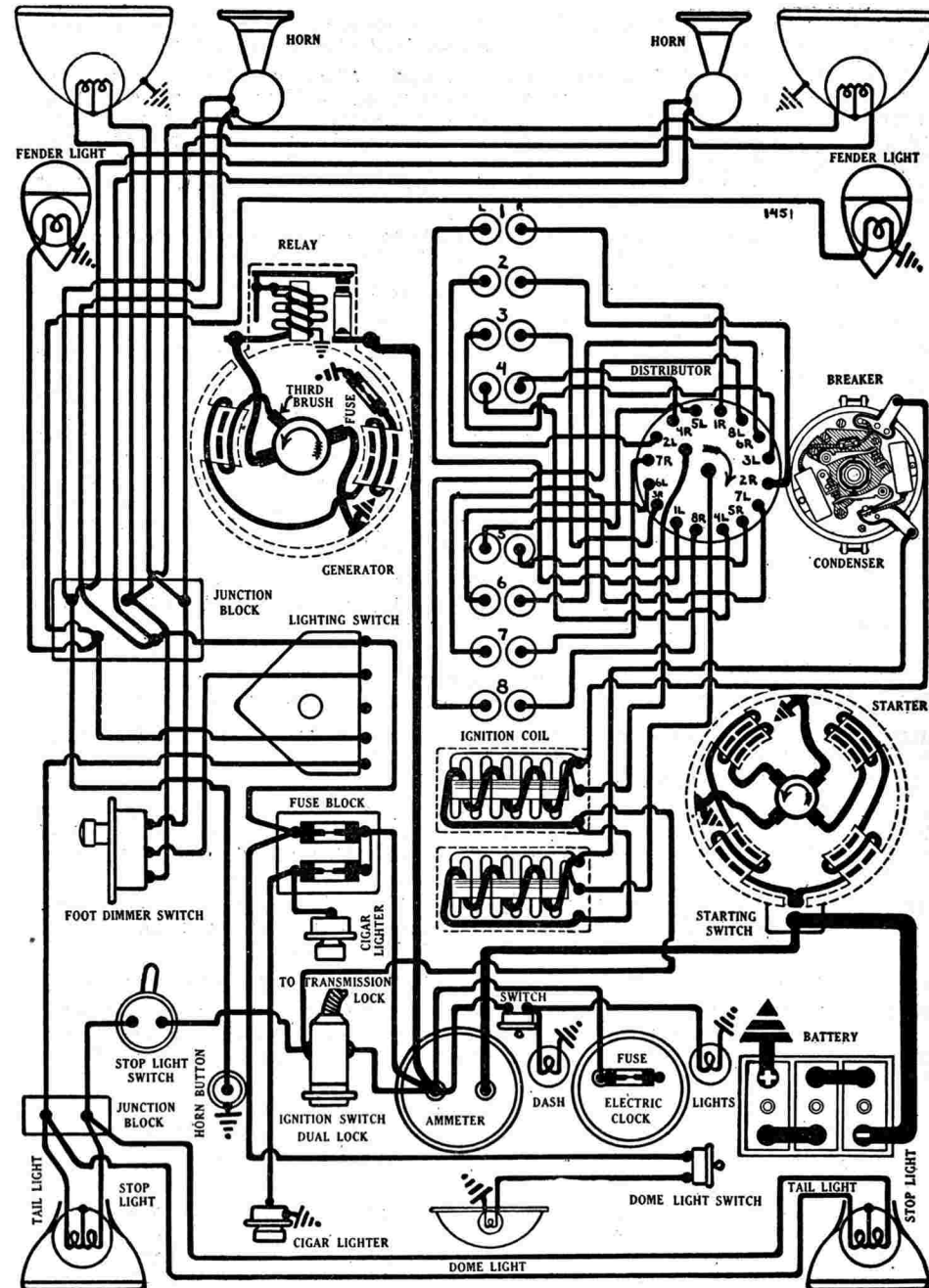
Breaker Arm Spring Tension:—20 ounces measured at tip of breaker arm.

Degrees	Automatic Advance		R.P.M.
Engine	Distributor	Distributor	Engine
0.....	Start.....	200.....	400.....
4.....	2.....	400.....	800.....
8.....	4.....	600.....	1200.....
12.....	6.....	800.....	1600.....
16.....	8.....	1000.....	2000.....

NOTE:—If trouble is experienced with distributor caps burning between terminals, the alignment of the rotor and distributor cap terminals should be checked. To do this it will be necessary to cut away a distributor cap so that the position of the rotor terminals with relation to the distributor cap terminals can be checked. The rotor terminals should be directly opposite the distributor cap terminals when the breaker contacts open. To correct incorrect alignment it will be necessary to elongate the two breaker plate mounting screw holes to a maximum length of $1\frac{1}{2}$ " so that the breaker plate may be rotated within the housing to correct the alignment. If necessary the slots in the housing through which the primary terminals pass can be lengthened with a file to allow the rotation of the breaker plate. Distributors now have two lines scratched on the inside of the housing in line with the notch in the breaker plate to indicate the correct position of the plate.

Mounting:—Distributor mounted on right hand side of crankcase. To remove, disconnect primary leads and manual spark control, take off distributor cap, take out hold-down screws in advance arm, lift distributor out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler under distributor. Take off distributor cap and rotor, put one drop oil on breaker arm pivot pins, put 2-3 drops oil in wick oiler in center of shaft, apply thin film of vaseline to face of breaker cam.



NASH

AMBASSADOR EIGHT SERIES 1190 (1933) AUTO-LITE SYSTEM

IGNITION TIMING:—With No. 1 piston on compression stroke turn engine over by hand until the 'IGN' mark on the vibration dampener at the front of the engine is directly under the pointer on the chain case. The 'IGN' mark is the first line on the dampener, the second line is the top dead center mark. Then loosen advance arm clamp bolt, rotate distributor until first or fixed set of contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt, connect spark plugs as indicated on diagram.

Synchronization of Contacts—first method. After distributor has been timed to engine (above) and without disturbing position of crankshaft or distributor, loosen lock screws on movable sub-plate, shift plate until second or movable contacts (mounted on the sub-plate) begin to open, tighten lock screws. Recheck timing to make certain that both sets of contacts open at the same instant. This is important to secure full advantage of 'Twin Ignition'.

Synchronization of Contacts—second method. See complete directions on synchronization of Type IGK Distributors in Equipment Section.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. A.C. Type J-9. Set gaps at .022 inch.

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine operates valves through pushrods and rocker arms on cylinder head. Tappet adjustment is located on rocker arms directly above pushrods. Camshaft is chain driven from the crankshaft by double Diamond roller chain. Drive is two-sprocket non-adjustable type and sprockets are marked. Chain must be installed endless and special pullers must be used to remove and install sprockets. To set timing, mesh sprockets in chain so that marks are adjacent and in line with straightedge laid across shaft centers. In removing or installing sprockets care must be taken to keep sprockets lined up so that no side-strain is placed on chain or sprockets.

Valve Specifications			
	Head Diameter	Seat Angle	Width of Seat
Intake	.1 24/32"	45°	1/16"
Exhaust	.1 19/32"	45°	1/16"

Tappet Clearance
Intake and Exhaust.....012" with engine hot and idling.

CARBURETION:—Stromberg Updraft Dual Carburetor, Model UUR-2 (see Carburetor Section for complete data). Manifold heat control and choke control are operated manually by buttons on the instrument panel.

Air Cleaner:—Oil-wetted wire mesh type. Remove complete unit at 3000-mile intervals, take off end cap (silencer), clean filter unit by dipping in pan of gasoline, dry thoroughly, re-oil by dipping in engine oil, drain before reassembling.

Fuel Pump:—A.C. combination fuel pump and vacuum pump. Remove sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model MAB-4024. Starter drive—Bendix. Starter switch mounted on starter and operated through flexible cable control by button on instrument panel. Starter rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	46
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	700	4.5	300
10.2 "	420	4.0	400
17.0 "	Lock	3.0	525
24.0 "	Lock	4.0	720

Note on Startix:—Startix automatic starting switch is optional equipment on these cars. When Startix is installed the original starting switch is modified by disconnecting the control cable and permanently blocking the switch contacts closed. The cut-out relay on the generator has a special terminal on the end of the case for Startix connection. See Equipment Section for complete data on Startix.

Mounting:—Sleeve mounted on right hand forward face of flywheel housing. To remove, disconnect cable, loosen lock nut and back out large pilot mounting screw in flywheel housing directly above starter sleeve, pull starter forward to clear Bendix housing, lift out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler at each end.

GENERATOR:—Model GAR-4601-3. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate is 17 amperes (cold) at 8.0 volts reached at 1700 R.P.M.

Generator Data		
Amperes	Volts	R.P.M.
2	6.4	750
6	6.9	885
10	7.3	1030
14	7.65	1230
17	8.0	1700
14	7.65	2200

Brush Spring Tension:—24-36 ounces on each brush.

Field Current:—4.46-4.94 amperes at 6.0 volts across field terminals.

Field Fuse:—7½ ampere capacity fuse under cover on top of generator.

Motoring:—4.89-5.41 amperes at 6.0 volts.

Mounting:—Cradle mounted at left front of engine with fan belt drive. Water pump is driven by extension of generator shaft. To remove, disconnect lead, disconnect water pump drive coupling, slack off belt adjustment and slip off drive belt, loosen mounting clamp band, lift generator out.

Belt Adjustment. Adjust fan belt when sideplay midway between generator and fan pulleys is more than 1½ inches when pressed lightly. To take up belt, loosen two cap screws on fan bracket, raise bracket until sideplay as measured above is about 1 inch, tighten mounting screws.

Oiling:—1000 Miles. Put 5-6 drops light engine oil in oiler at each end.

RELAY:—Model CB-4021. Mounted on generator field frame. Relay contacts close at approximately 750 R.P.M. when generator voltage reaches 7-7.5 volts with charging current of approximately 2 amperes and open with .5-2.5 ampere discharge current. Generator main brush lead is connected to terminal under relay case, which is connected to Startix terminal on the end of the case.

Contact Gap:—.025-.035". **Air Gap:**—.010-.030" with contacts closed.

LIGHTING:—Delco-Remy Lighting Switch, Model 486-K. Dimmer Switch Model 465-P. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Double filament headlight bulbs are used for 'depressed beam' dimming and are controlled by foot-operated switch on toeboard. Stop and tail lights are fitted with double filament bulbs.

Lamp Sizes				
Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome Light	6-8	4	D.C.	.....

FUSES:—Two 20-ampere capacity lighting fuses mounted on fuse block on engine side of dash. 7½ ampere capacity field fuse mounted on top of generator field frame.

OLDSMOBILE

SIX CYLINDER MODEL F-33 (1933), SERIAL NUMBERS 24,001 UP
DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On plate on right hand side of front compartment floor in front of right front seat (sedans) or under right front seat (coupes).

ENGINE NUMBER:—On car serial number plate.

ENGINE:—Six cylinder, 'L' head type, $3\frac{3}{8} \times 4\frac{1}{8}$ " bore and stroke, 221.4 cubic inch displacement, rated at 27.34 H.P., develops 80 H.P. at 3200 R.P.M. Standard compression ratio 5.3-1. Standard compression pressure 104-107 pounds at 1000 R.P.M.

BATTERY:—Delco, Type 13-L-CU (domestic cars), 13-LF (export), 6 volt, 13 plate, 86 ampere hour capacity (20 hour rate). Starting capacity 102 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—On left hand side of frame under driver's seat.

Dimensions:—Width, 7". Length, $9\frac{1}{16}$ ". Height, $8\frac{5}{8}$ ".

IGNITION:—Coil Model 534-T. Lock coil type with ignition switch in base.

Ignition Current:—2-2.5 amperes at 6 volts (engine running), 4.5 amperes at 6 volts (engine stopped).

Ignition Switch:—Gasoline gauge and stop lamp connected to auxiliary terminal on coil and controlled by ignition switch (operative only with switch turned 'on').

Distributor Model 632-P. Single breaker, 6 lobe cam, full automatic advance type. Contact gap adjusted by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw.

Breaker Gap:—Set contact gap at .022". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
3	Start	300	600		
11.5	5.75	600	1200		
28	14	1500	3000		

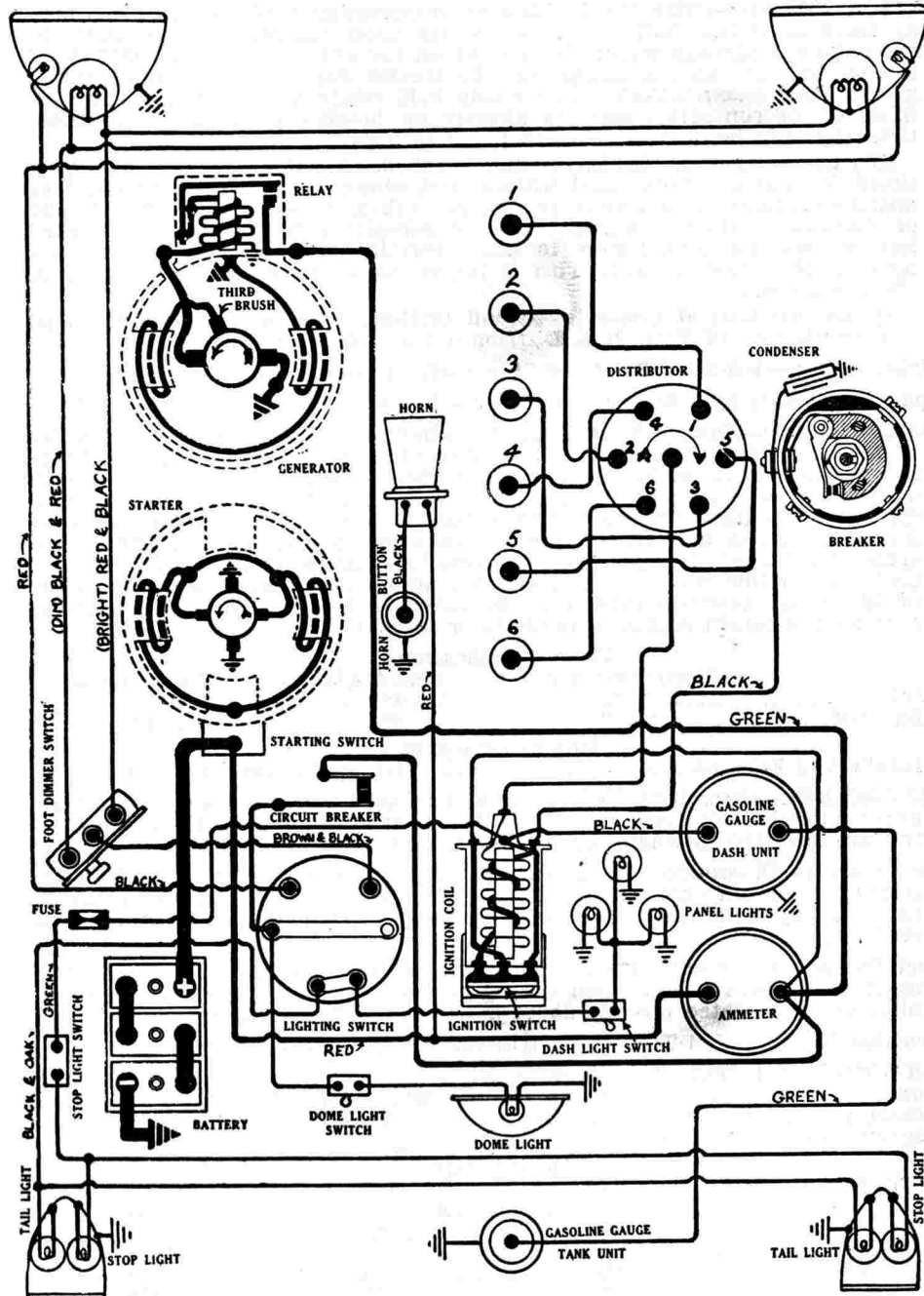
Mounting:—On top of cylinder head on right side. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance plate, lift distributor out.

Oiling:—500 Miles. Turn down grease cup on side of shaft housing one full turn. Keep cup filled with No. 2½ grease.

1000 Miles. Take off distributor cap and rotor, fill wick oiler in center of shaft with light engine oil, put one drop of oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting, $3\frac{1}{2}^\circ$ (flywheel) or .0046" (piston travel) before top dead center.

To Set Ignition Timing. First loosen hold-down screw in advance plate, center pointer of plate on scale (pointer should be opposite '0' or center division of scale), tighten hold-down screw. With No. 1 piston on compression stroke, turn engine over by hand until piston reaches firing position with the first line on the vibration dampener at the front of the engine directly under the pointer on the chain case. Then loosen clamp bolt in advance plate, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.



OLDSMOBILE

SIX CYLINDER MODEL F-33 (1933), SERIAL NUMBERS 24,001 UP

DELCO-REMY SYSTEM

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. A.C. Type G-9. Set gaps at .025 inch.

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine is driven by two-sprocket non-adjustable chain drive from the crankshaft. Sprockets are marked. To set timing, mesh sprockets in chain so that marks are adjacent and in line with a straightedge laid across the shaft centers.

To Check Valve Timing. With No. 1 piston on top dead center entering power stroke set tappet clearance of No. 1 intake valve at .010". Turn engine over one complete revolution and stop with piston on top dead center when the second mark on the vibration dampener at the front of the engine is directly under the pointer on the chain case. No. 1 intake valve should begin to open at this point. Reset tappet clearance at .007-.009" with engine warm.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 5/8"	11/32"	5 3/8"	30°	.320"
Exhaust	1 1/2"	3/8"	5 3/8"	30°	.320"

Tappet Clearance

	Operating	Timing
Intake	.008" (hot)	.010"
Exhaust	.010" (hot)	.010"

Valve Springs

Closed	43 pounds	—2 1/4"
Open	96 pounds	—1 29/32"

Intake Valves	Timing	Exhaust Vales
Open—At top dead center	.010" lash	Open 40° before lower dead center
Close—50° after lower dead center.		Close—10° after top dead center

CARBURETION:—Stromberg Downdraft Carburetor, Model EC-22 with Fast Idle and Stromberg Automatic Choke. See Carburetor Section for complete data. Manifold heat control is automatic.

Air Cleaner:—A.C. oil-wetted wire mesh type integral with silencer. Remove complete unit at 2500 mile intervals, clean by dipping wire mesh end of unit in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical Fuel Pump mounted on right side of crankcase and driven by eccentric on camshaft. Remove glass sediment bowl under pump occasionally, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—A.C. electric type (see Equipment Section).

STARTER:—**Model 734-K.** Starter drive—Overrunning clutch and mechanical pinion shift connected to starting switch pedal (switch mounted on starter field frame). Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5.0	65
12 "	Lock	3.63	475

Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage, take out flange mounting bolts, pull starter forward to clear pinion housing, lift out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in commutator end oiler. Drive end bearing at outer end of pinion housing is oilless.

GENERATOR:—**Model 953-S.** Third brush regulation, thermostat control. Thermostat contacts open at 200°F. reducing the charging rate approximately 40%. Generator rotation counter-clockwise at commutator end. Maximum charging rate is 19-21 amperes (cold) at 8.5 volts reached at 1450 R.P.M.

Charging Rate Adjustment. Loosen small lock screw on commutator end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten lock screw.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.35-8.5	1450	9-12	7.35-7.65	1800-2000

Brush Spring Tension:—14-18 ounces on each brush.

Field Current:—4-6.1 amperes at 6 volts across field terminals.

Motoring:—Approximately 5.5 amperes at 6 volts.

Mounting:—Pivot mounting at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out two bolts forming bracket hinge, lift generator out.

Belt Adjustment. Loosen mounting bolts and adjustment clamp bolt, swing generator away from engine until correct belt tension is secured, tighten adjustment clamp bolt and mounting bolts. Belt tension should be just sufficient to drive generator and fan without slipping.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler at each end.

RELAY:—**Model 265-G.** Mounted on generator field frame. Contacts close at 825 R.P.M. or 10 M.P.H. with generator voltage of 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—**Delco-Remy Switch Model 478-Y.** **Dimmer Switch Model 465-W.** Lighting switch mounted on back of instrument board controlled by push-pull button on instrument panel. Lighting system Guide "Tilt-Ray" with depressed beam dimming swing double filament headlight bulbs controlled by foot operated dimmer switch on toeboard. Stop light switch is Delco-Remy Model 474-K.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21	D.C.	1116
Parking Bulbs	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tail Light	6-8	15	S.C.	87
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81

CIRCUIT BREAKER:—The circuit breaker mounted on the lighting switch bracket consists of a thermostatic arm through which the lighting current is taken to the switch. An excessive current flow due to a ground or short-circuit will cause the thermostatic arm to open the circuit breaker contacts thus protecting the lighting circuits from damage. This circuit breaker differs from previous designs in that there is no coil and the contacts are opened directly by the thermostatic arm.

FUSES:—15 ampere capacity fuse assembled in connector in stop light cable.

HORN:—Klaxon Model K-18-C. Vibrator type horn mounted under engine hood. Current drawn by horn 5.5-6.5 amperes at 6 volts.

OLDSMOBILE

EIGHT CYLINDER MODEL L-33 (1933), SERIAL NUMBERS 7001 UP

DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On plate on right hand side of front compartment floor in front of right front seat (sedans) or under seat (5 passenger coupes).

ENGINE NUMBER:—On car serial number plate.

ENGINE:—Eight cylinder, 'L' head type, 3x4½" bore and stroke, 240.3 cubic inch displacement, rated at 28.8 H.P., develops 90 H.P. at 3350 R.P.M. Standard compression ratio 5.5-1. Standard compression pressure 111-114 pounds at 1000 R.P.M.

BATTERY:—Delco, Type 13J-CU (Domestic), Type 13-JF (Export), 6 volt, 13 plate, 98 ampere hour capacity (20 hour rate). Starting capacity 117 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—On left hand side of frame under driver's seat.

Dimensions:—Width, 7". Length, 9 1/16". Height, 9 1/8".

IGNITION:—Coil Model 534-T. Lock coil type with ignition switch in base.

Ignition Current:—5-2.5 amperes at 6 volts (engine running), 4.5 amperes at 6 volts (engine stopped).

Ignition Switch:—Gasoline gauge and stop lamp connected to auxiliary terminal on coil and controlled by ignition switch (operative only with switch turned 'on').

Distributor Model 662-K. Two breaker, 4 lobe cam, full automatic advance type. Contacts open alternately at 45° intervals corresponding to 90° firing interval of engine. Breaker contacts must be synchronized (see Timing). Contact gap adjusted by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw.

Breaker Gap:—Set contact gap at .022". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
4	Start	300	600		
15.5	7.75	800	1600		
26	13	1350	2700		

Mounting:—Distributor mounted on right hand side of cylinder head. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

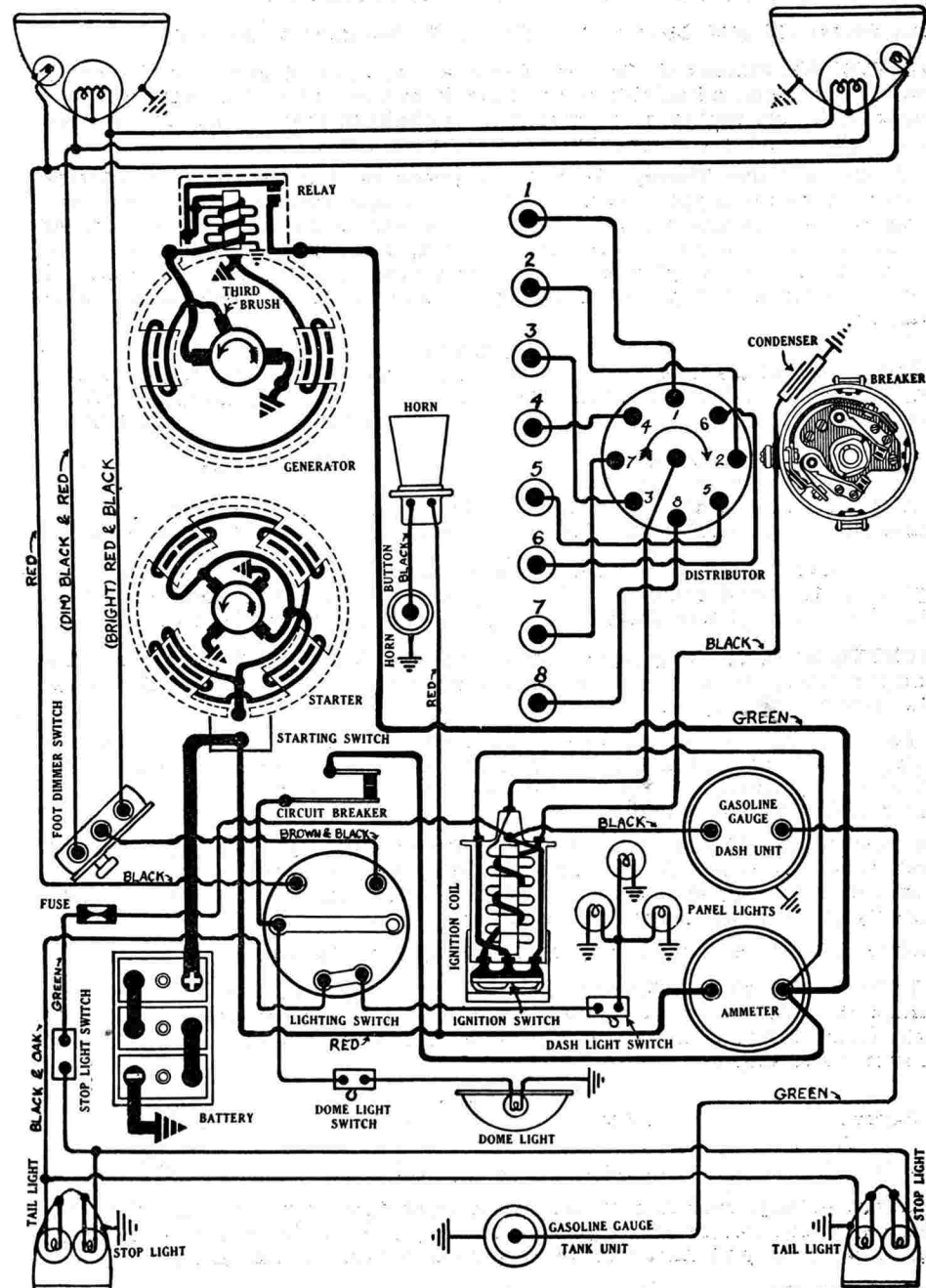
Oiling:—500 Miles. Turn down grease cup on side of shaft housing one full turn. Keep cup filled with No. 2½ cup grease.

1000 Miles. Take off distributor cap and rotor, fill wick oiler in center of shaft with light engine oil, put one drop of oil on breaker arm pivot pins, apply thin film of vaseline to face of breaker cam.

IGNITION SETTING:—Standard setting 3½° (flywheel) or .0048" (piston travel) before top dead center.

To Set Ignition Timing. First loosen hold-down screw in advance plate, center pointer of plate on scale (pointer be directly opposite '0' or center division of scale), tighten hold-down screw. With No. 1 piston on compression stroke, turn engine over by hand until piston reaches firing position with the first line on the vibration dampener at the front of the engine directly under the pointer on the chain case. Then loosen clamp bolt in advance plate, rotate distributor until first or 'fixed' set of contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated. The second or 'movable' set of contacts must be synchronized.

Synchronization of Contacts. No marks are provided to time the second set of contacts to the engine directly and they must be synchronized by



OLDSMOBILE

EIGHT CYLINDER MODEL L-33 (1933), SERIAL NUMBERS 7001 UP DELCO-REMY SYSTEM

means of the special synchronizing tool, Oldsmobile Part No. HM-J-185, or Delco-Remy tool, Part No. 1838182 (see Equipment Section for complete data on synchronization of contacts). Contacts can also be synchronized on a rotary spark gap or directly on the engine if a timing gauge is used with special adaptors so that gauge may be mounted on No. 6 cylinder.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. A.C. Type G-9. Set gaps at .025 inch.

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine is driven by two-sprocket non-adjustable chain drive from the crankshaft. Sprockets are marked. To set timing, mesh sprockets in chain so that marks on sprockets are adjacent and in line with straightedge laid across shaft centers.

To Check Valve Timing. With No. 1 piston on top dead center entering power stroke, set tappet clearance of No. 1 intake valve at .010". Turn engine over one complete revolution and stop with piston on top dead center when the second mark on the vibration dampener at the front of the engine is directly under the pointer on the chain case. No. 1 intake valve should begin to open at this point. Reset tappet clearance at .007-.009" with engine warm.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 9/16"	11/32"	5 9/32"	30°	.300"
Exhaust	1 7/16"	3/8"	5 9/32"	30°	.300"

Tappet Clearance

	Operating	Timing
Intake	.008" (hot)	.010"
Exhaust	.010" (hot)	.010"

Valve Springs

	Closed	Open
Intake	43 pounds—2 1/4"	96 pounds—1 29/32"
Exhaust	43 pounds—2 1/4"	96 pounds—1 29/32"

Intake Valves

	Timing—.010" lash	Exhaust Valves
Open—At top dead center	Open—40° before lower dead center	
Close—42° after lower dead center	Close—10° after top dead center	

NOTE:—Valve stem clearance in guide should be .00125-.00325" (intake), .00225-.00425" (exhaust).

CARBURETION:—Stromberg Downdraft Carburetor, Model EE-22 with Fast Idle and Stromberg Automatic Choke. See Carburetor Section for complete data on this equipment. Manifold heat control is automatic.

Air Cleaner:—A.C. oil-wetted wire mesh type integral with silencer. Remove complete unit at 2500 miles intervals, clean by dipping wire mesh end of unit in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical Fuel Pump mounted on right hand side of crankcase and driven by eccentric on camshaft. Remove glass sediment bowl under pump occasionally, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—A.C. Electric type (see Equipment Section).

STARTER:—Model 725-Y. Starter drive—overrunning clutch and mechanical pinion shift connected to starting switch pedal (switch mounted on starter field frame). Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter draws 150 amperes cranking engine.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5.0	60
15 "	Lock	3.0	600

Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage, take out flange mounting bolts, pull starter forward to clear pinion housing, lift out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in commutator end oiler.

Drive end bearing at outer end of pinion housing is oilless.

GENERATOR:—Model 953-S. Third brush regulation, thermostat control. Thermostat contacts open at 200°F. reducing the charging rate approximately 40%. Generator rotation counter-clockwise at commutator end. Maximum charging rate is 19-21 amperes (cold) at 8.5 volts reached at 1450 R.P.M.

Charging Rate Adjustment. Loosen small lock screw on commutator end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten lock screw.

Generator Data

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
19-21	8.35-8.5	1450	9-12	7.35-7.65	1800-2000

Brush Spring Tension:—14-18 ounces on each brush.

Field Current:—4-6.1 amperes at 6 volts across field terminals.

Motoring:—Approximately 5.5 amperes at 6 volts.

Mounting:—Pivot mounting at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out two bolts forming bracket hinge, lift generator out.

Belt Adjustment. Loosen mounting bolts and adjustment clamp bolt, swing generator away from engine until correct belt tension is secured, tighten adjustment clamp bolt and mounting bolts. Belt tension should be just sufficient to drive generator and fan without slipping.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler at each end.

RELAY:—Model 265-G. Mounted on generator field frame. Contacts close at 825 R.P.M. or 10 M.P.H. with generator voltage of 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Delco-Remy Switch Model 478-Y. Dimmer Switch Model 465-W. Lighting switch mounted on back of instrument board controlled by push-pull button on instrument panel. Lighting system Guide 'Tilt-Ray' with depressed beam dimming swing double filament headlight bulbs controlled by foot operated dimmer switch on toeboard. Stop light switch is Delco-Remy Model 474-K.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21	D.C.	1116
Parking Bulbs	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tail Light	6-8	15	S.C.	87
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81

CIRCUIT BREAKER:—The circuit breaker mounted on the lighting switch bracket consists of a thermostatic arm through which the lighting current is taken to the switch. An excessive current flow due to a ground or short-circuit will cause the thermostatic arm to open the circuit breaker contacts thus protecting the lighting circuits from damage. This circuit breaker differs from previous designs in that there is no coil and the contacts are opened directly by the thermostatic arm.

FUSES:15 ampere capacity fuse assembled in connector in stop light cable.

HORN:—Klaxon Model K-18-C. Vibrator type horn mounted under engine hood. Current drawn by horn 5.5-6.5 amperes at 6 volts.

PACKARD

EIGHT MODEL 1001, 1002 (1933)

OWEN-DYNETO GENERATING, STARTING SYSTEM NORTH EAST IGNITION

CAR SERIAL NUMBER:—On plate on left hand front side of dash.

ENGINE NUMBER:—On top of left hand front motor support arm.

ENGINE:—Eight cylinder, 'L' head type, 3 3/16x5" bore and stroke, 320 cubic inch displacement, rated at 32.5 H.P., develops 120 H.P. at 3200 R.P.M. Standard compression ratio 6.0-1. Standard compression pressure 95-100 pounds at 125 R.P.M. Optional high compression ratio 6.36-1. Optional low compression ratio 5.0-1. A distinct ignition setting is used for each compression ratio (see Timing). Standard compression engines are not marked. High compression heads are marked 'H.C.' and low compression heads are marked 'L.C.'.

BATTERY:—Prest-O-Lite, Type A-619-ST, 6 volt, 19 plate, 144 ampere hour capacity (5 ampere rate). Starting capacity 170 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—On left hand side of frame under drivers' seat.

Dimensions:—Width, 7". Length, 12 15/16". Height, 9 3/16".

IGNITION:—Coil Type 5033449. Two coils are assembled as unit with ignition switch with an armored cable on the primary lead. Coils mounted on the cylinder head at left of distributor.

Ignition Current:—1.3 amperes at 6 volts (engine running), 5 amperes at 6 volts (engine stopped) for each coil.

Ignition Switch:—Electrolock, Type 16-S. Switch is assembled as a unit with the coils (see Equipment Section for complete data).

Distributor Type 5033450. Double breaker, 4-lobe cam, full automatic advance type. Contacts separate alternately at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Timing). Each set of contacts controls one coil and fires the spark plugs in four cylinders.

Breaker Gap:—Set contact gap .020". Hold within limits of .018-.022".

Breaker Arm Spring Tension:—15-19 ounces.

Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start	300	600	
15	7 1/2	1400	2800	

Mounting:—Distributor mounted on right hand side of cylinder head. To remove, disconnect primary leads, take off distributor cap, take out hold-down screw in advance plate, lift out.

Oiling:—1000 Miles. Turn down grease cup under distributor cup one turn. Keep cup filled with No. 3 cup grease. Take off distributor cap and rotor, put one drop of oil on breaker arm pivot pins, oil cam felt oiler on breaker plate.

IGNITION TIMING:—Standard setting for each compression ratio as follows:

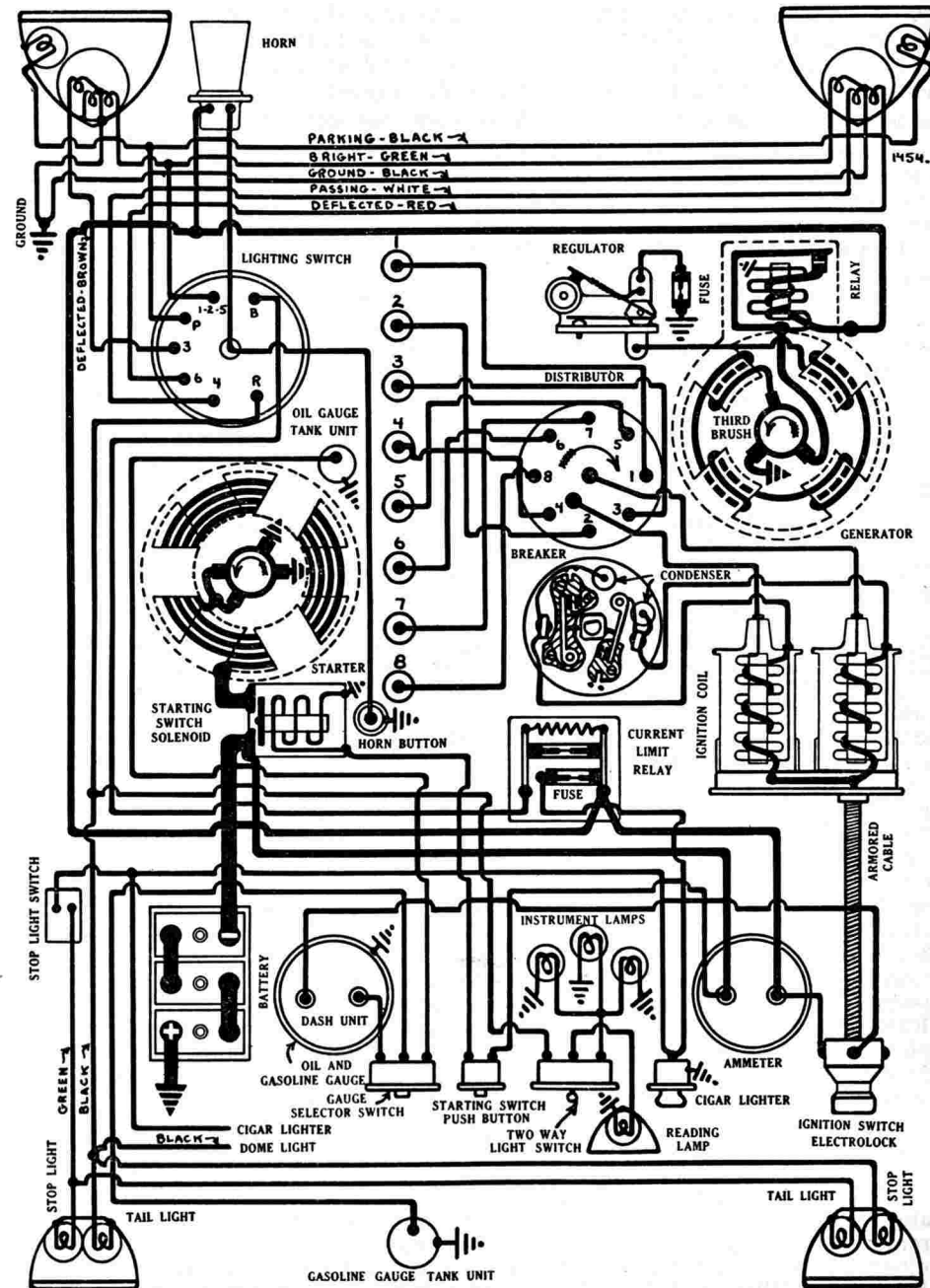
Low Compression—14° (flywheel), .0912" (piston) before top dead center.

Std. Compression—9° (flywheel), .0379" (piston) before top dead center.

High Compression—7° (flywheel), .0229" (piston) before top dead center.

To Set Ignition Timing:—Vibration dampener at front of engine is marked 'D.C-1-8' at top dead center point for piston No. 1 and has fifteen one-degree marks before the dead center mark. To set timing, crank engine over by hand with No. 1 piston on compression stroke until piston reaches firing position with the proper mark on the vibration dampener directly under the pointer on the chain case (this will be the fourteenth, ninth or seventh line before the top dead center mark, depending upon the compression ratio of the engine). Then loosen advance arm clamp bolt, rotate distributor until first or 'fixed' set of contacts begin to open, tighten clamp bolt. The second or 'movable' set of contacts are timed by synchronizing the contacts—see below:

Synchronization of Contacts:—After distributor has been timed to engine (above), turn crankshaft 90° or 1/4 revolution to firing position of piston No. 6 and stop with correct line on the vibration dampener at the front of the engine under the pointer on the chain case (the dampener is marked for top dead center of piston No. 6 and has the usual 1-degree reference marks before this point, the correct ignition marks being the fourteenth,



PACKARD

EIGHT MODEL 1001, 1002 (1933)

OWEN-DYNETO GENERATING, STARTING SYSTEM

NORTH EAST IGNITION

ninth or seventh line before the dead center point). Then loosen lock screws on movable breaker sub-plate (carrying the second set of contacts), shift plate by inserting a screwdriver in the slot in the edge of the plate until contacts begin to open, tighten lock screws. The first or 'fixed' set of contacts will open again 90° or ¼ revolution after this point.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator. See diagram for correct connection of spark plug cables.

Spark Plugs:—14 MM. Metric. A.C. Type K-7. Set gaps at .025".

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine is chain driven from the crankshaft in tandem with the generator. Chain is adjusted manually by shifting the generator (see Generator Mounting). Sprockets are marked. Chain should be meshed with sprockets turned so that marks are adjacent and in line with a straightedge laid across the shaft centers.

Valve Specifications					
Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 21/32"	3405"	7 3/8"	45°	358"
Exhaust	1 15/32"	3405"	7 3/8"	45°	358"
Tappet Clearance			Valve Springs		
Intake	.004" (hot).		Closed	73 pounds—3 1/16".	
Exhaust	.004" (hot).		(Total for both springs.)		

Timing		Timing	
Intake Valves		Exhaust Valves	
Open—30° before top dead center.		Open—65° before lower dead center.	
Close—65° after lower dead center.		Close—30° after top dead center.	

CARBURETION:—Stromberg Duplex Downdraft Carburetor, Model EE-22 (see Carburetor Section for complete data). Stromberg automatic choke is standard equipment.

Air Cleaner:—A.C. oil-wetted wire mesh type. Remove complete unit at 2500-mile intervals, clean wire mesh by dipping in pan of gasoline, dry thoroughly, re-oil by dipping in engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical type combination fuel and vacuum pump (see Equipment Section for complete data). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—Motometer electric combination gasoline and oil gauge (see Equipment Section).

STARTER:—Model DI-1034. Starter drive—Outboard Bendix. Rotation counter-clockwise at commutator end. Brush spring tension 26-28 ounces. Starter is a six-pole series wound motor with a single field coil so constructed that it winds around three sides of each field pole. There are four main brushes, two field lead brushes and two ground brushes, each connected in parallel.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3500-4000	6.0	60
27 "	Lock	3.5	650

Starter Switch:—Model 21518. Electro-magnetic type mounted on starter field frame and controlled by button on instrument panel. Main switch contacts are closed by switch solenoid, which is controlled by starting button.

Mounting:—Sleeve mounted on left hand forward face of flywheel housing. To remove, disconnect cable and switch leads or take off switch, back off lock nut and take out large pilot mounting screw on housing directly above starter sleeve. Pull starter forward to clear Bendix housing, lift out.

Oiling:—Starter bearings are oilless and require no attention.

GENERATOR:—Model CL-1005. Third brush regulation in conjunction with Battery Charge Regulator (see Equipment Section for complete data on Regulator). Rotation counter-clockwise at commutator end. Maximum charging rate is 18 amperes (cold) at 8.1 volts reached at 1300 R.P.M.

Charging Rate Adjustment. Third brush shifted through rack-and-pinion control by slotted adjusting screw on endplate. To adjust, take off commutator cover, turn adjusting screw to right or clockwise to increase, or to left or counter-clockwise to decrease charging rate.

Generator Data		
Amperes	Volts	R.P.M.
0	6.2	480
8	7.0	680
18	8.1	1300
12	7.4	4000

Field Fuse:—3 ampere capacity in plug in regulator cover.

Mounting:—Flange mounted on right hand rear face of timing chain case. To remove, disconnect lead, take out three flange mounting cap screws, slide generator to rear to disengage drive coupling, lift out. Do not disturb intermediate flange carrying drive sprocket and generator drive end bearing. Generator cannot be driven on a test bench without a special bearing being used on the drive end.

Chain Adjustment. To take up timing chain, loosen generator flange mounting screws, pull generator away from engine, tighten mounting screws. There is a plug on the top of the chain case which can be removed to inspect timing chain adjustment. With correct adjustment chain should run noiselessly. If chain hums, adjustment is too tight and generator should be backed off slightly.

Oiling:—500 Miles. Few drops light engine oil in commutator end oiler. Drive end bearing is oiled from the chain case.

RELAY-REGULATOR:—Model 21262. Consists of cut-out relay and Battery Charge Regulator mounted on generator field frame. Relay contacts close at 480 R.P.M. with generator voltage of 6.2 volts and open with 0-2 ampere discharge current.

Contact Gap:—.015". **Air Gap:**—.010" with contacts closed.

Battery Charge Regulator is set to operate with generator voltage of 8.0 volts (cold) or 7.6 volts (hot) and reduces charging rate approximately one half by cutting resistance in field circuit (see Equipment Section for complete data on Regulator).

LIGHTING:—Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Lighting system employs new type triple filament bulbs and switch has special 'passing' position in addition to regular driving and 'depressed beam' positions.

Lamp Sizes			
Position	Voltage	Candlepower	Base Mazda No.
Headlights	6-8	32-32-32	Triple 3003
Fender Lights	6-8	3	S.C. 63
Instrument and Tail Lights	6-8	3	S.C. 63
Stop Lights	6-8	15	S.C. 87
Dome Light	6-8	6	S.C. 81
Body Lights	6-8	3	S.C. 63

FUSES:—Lighting fuses mounted on block on dash are 20 ampere capacity. Generator field fuse mounted in plug on regulator cover is 3 ampere capacity.

CURRENT LIMIT RELAY:—Mounted on dash. Consists of a fixed resistance connected across a 20 ampere fuse. Resistance limits current when fuse burns out with 20 ampere current load.

PACKARD

SUPER-EIGHT MODELS 1003, 1004 (1933)

OWEN-DYNETO GENERATING, STARTING SYSTEM NORTH EAST IGNITION

CAR SERIAL NUMBER:—On plate on left hand front side of dash.

ENGINE NUMBER:—On top of left hand front motor support arm.

ENGINE:—Eight cylinder, 'L' head type, $3\frac{1}{2} \times 5$ " bore and stroke, 384.8 cubic inch displacement, rated at 39.2 H.P., develops 145 H.P. at 3200 R.P.M. Standard compression ratio 6.0-1. Standard compression pressure 95-100 pounds at 125 R.P.M. Optional high compression ratio 6.38-1. Optional low compression ratio 5.0-1. A different ignition setting is used for each compression ratio (see Timing). Standard compression engines are not marked. High compression heads are marked 'H.C.' and low compression heads are marked 'L.C.' for identification.

BATTERY:—Prest-O-Lite, Type A-619-ST, 6 volt, 19 plate, 144 ampere hour capacity (5 ampere rate). Starting capacity 173 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to frame.

Mounting:—On left hand side of frame under driver's seat.

Dimensions:—Width, 7". Length, 13". Height, $9\frac{3}{16}$ ".

IGNITION:—Coil Type 5033449. Two coils are assembled as unit with ignition switch with an armored cable on the primary lead. Coils mounted on the cylinder head at the left of the distributor.

Ignition Current:—1.3 amperes at 6 volts (engine running), 5 amperes at 6 volts (engine stopped) for each coil.

Ignition Switch:—Electrolock, Type 16-S. Switch is assembled as a unit with the coils (see Equipment Section for complete data).

Distributor Type 5033450. Double breaker, 4-lobe cam, full automatic advance type. Contacts separate alternately at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Timing). Each set of contacts controls one coil and fires the spark plugs in four cylinders.

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.022".

Breaker Arm Spring Tension:—15-19 ounces.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start		300		600
15	$7\frac{1}{2}$		1400		2800

Mounting:—Distributor mounted on right hand side of cylinder head. To remove, disconnect primary leads, take off distributor cap, take out hold-down screw in advance plate, lift out.

Oiling:—1000 Miles. Turn down grease cup under distributor cup one turn. Keep cup filled with No. 3 cup grease. Take off distributor cap and rotor put one drop of oil on breaker arm pivot pins, oil cam felt oiler on breaker plate.

IGNITION TIMING:—Standard setting for each compression ratio as follows:

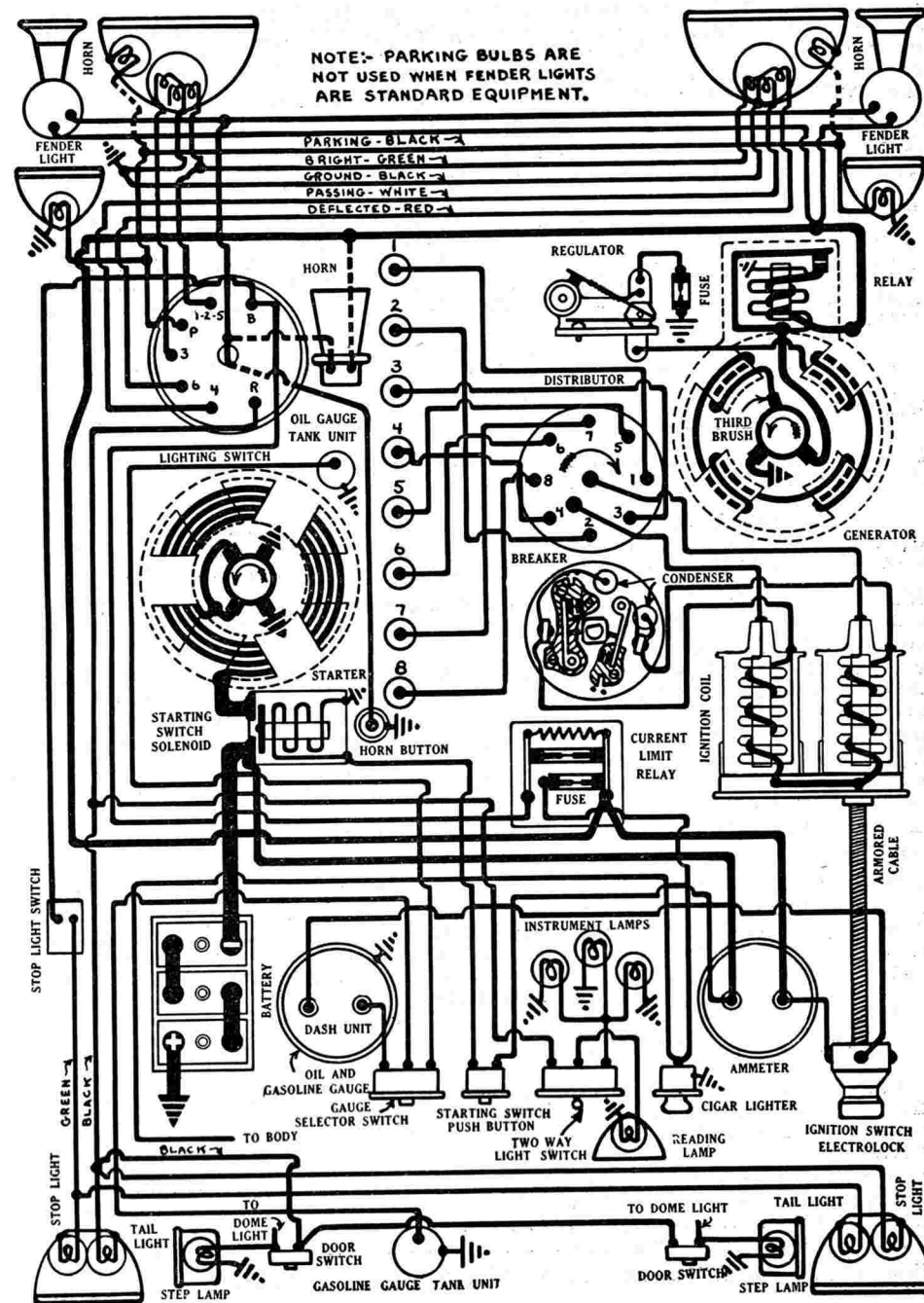
Low Compression— 14° (flywheel), .0912" (piston) before top dead center.

Std. Compression— 9° (flywheel), .0379" (piston) before top dead center.

High Compression— 4° (flywheel), .0075" (piston) before top dead center.

To Set Ignition Timing:—Vibration dampener at front of engine is marked 'D.C.-1-8' at top dead center point for piston No. 1 and has fifteen one-degree marks before the dead center mark. To set timing, crank engine over by hand with No. 1 piston on compression stroke until piston reaches firing position with the proper mark on the vibration dampener directly under the pointer on the chain case (this will be the fourteenth, ninth or fourth line before the top dead center mark, depending upon the compression ratio of the engine). Then loosen advance arm clamp bolt, rotate distributor until first or 'fixed' set of contacts begin to open, tighten clamp bolt. The second or 'movable' set of contacts are timed by synchronizing the contacts—see below:

Synchronization of Contacts:—After distributor has been timed to engine (above), turn crankshaft 90° or $\frac{1}{4}$ revolution to firing position of piston No. 6 and stop with correct line on the vibration dampener at the front of the engine under the pointer on the chain case (the dampener is marked for top dead center of piston No. 6 and has the usual 1-degree reference marks before this point, the correct ignition marks being the fourteenth, ninth or fourth line before the dead center point). Then loosen lock screws



PACKARD

SUPER-EIGHT MODELS 1003, 1004 (1933)

OWEN-DYNETO GENERATING, STARTING SYSTEM

NORTH EAST IGNITION

on movable breaker sub-plate (carrying the second set of contacts), shift plate by inserting a screwdriver in the slot in the edge of the plate until contacts begin to open, tighten lock screws. The first or 'fixed' set of contacts will open again 90° or ¼ revolution after this point.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator. See diagram for correct connection of spark plug cables.

Spark Plugs:—14 MM. Metric. A.C. Type K-7. Set gaps at .025".

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is chain driven from the crankshaft in tandem with the generator. Chain is adjusted manually by shifting the generator (see Generator Mounting). Sprockets are marked. Chain should be meshed with sprockets turned so that marks are adjacent and in line with a straightedge laid across the shaft centers.

Valve Specifications					
Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 13/16"	3/4"	7 3/8"	45°	358"
Exhaust	1 11/16"	3/4"	7 3/8"	45°	358"
Tappet Clearance			Valve Springs		
Intake	.004" (hot).		Closed	73 pounds—3 1/16".	
Exhaust	.004" (hot).		(Total for both springs.)		
Intake Valves		Timing		Exhaust Valves	
Open—30° before top dead center.		Open—65° before lower dead center.		Close—30° after top dead center.	
Close—65° after lower dead center.		Close—30° after top dead center.			

CARBURETION:—Stromberg Duplex Downdraft Carburetor, Model EE-22 (see Carburetor Section for complete data). Stromberg automatic choke is standard equipment.

Air Cleaner:—A.C. oil-wetted wire mesh type. Remove complete unit at 2500-mile intervals, clean wire mesh by dipping in pan of gasoline, dry thoroughly, re-oil by dipping in engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical type combination fuel and vacuum pump (see Equipment Section for complete data). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—Motometer electric combination gasoline and oil gauge (see Equipment Section).

STARTER:—Model DN-1107. Starter drive—Outboard Bendix. Rotation counter-clockwise at commutator end. Brush spring tension 26-28 ounces. Starter is a six-pole series wound motor with a single field coil so constructed that it winds around three sides of each field pole. There are four main brushes, two field lead brushes and two ground brushes, each connected in parallel.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	6.0	50
35 "	Lock	3.5	650

Starter Switch:—Model 21518. Electro-magnetic type mounted on starter field frame and controlled by button on instrument panel. Main switch contacts are closed by switch solenoid, which is controlled by starting button.

Mounting:—Sleeve mounted on left hand forward face of flywheel housing. To remove, disconnect cable and switch leads or take off switch, back off lock nut and take out large pilot mounting screw on housing directly above starter sleeve. Pull starter forward to clear Bendix housing, lift out.

Oiling:—Starter bearings are oilless and require no attention.

GENERATOR:—Model CL-1005, CO-1130. Third brush regulation in conjunction with Battery Charge Regulator (see Equipment Section for complete data on Regulator). Rotation counter-clockwise at commutator end. Maximum charging rate is 18 amperes (cold) at 8.1 volts reached at 1300 R.P.M.

Charging Rate Adjustment. Third brush shifted through rack-and-pinion control by slotted adjusting screw on endplate. To adjust, take off commutator cover, turn adjusting screw to right or clockwise to increase, or to left or counter-clockwise to decrease charging rate.

Generator Data—Model CL-1005		
Amperes	Volts	R.P.M.
0	6.2	480
8	7.0	680
18	8.1	1300
12	7.4	4000
Generator Data—Model CO-1130		
0	6.5	475
20	7.5	1000
24	8.0	1400
13	8.0	5000

Field Fuse:—3 ampere capacity in plug in regulator cover.

Mounting:—Flange mounted on right hand rear face of timing chain case. To remove, disconnect lead, take out three flange mounting cap screws, slide generator to rear to disengage drive coupling, lift out. Do not disturb intermediate flange carrying drive sprocket and generator drive end bearing. Generator cannot be driven on a test bench without a special bearing being used on the drive end.

Chain Adjustment. To take up timing chain, loosen generator flange mounting screws, pull generator away from engine, tighten mounting screws. There is a plug on the top of the chain case which can be removed to inspect timing chain adjustment. With correct adjustment chain should run noiselessly. If chain hums, adjustment is too tight and generator should be backed off slightly.

Oiling:—500 Miles. Few drops light engine oil in commutator end oiler. Drive end bearing is oiled from the chain case.

RELAY-REGULATOR:—Model 21262. Consists of cut-out relay and Battery Charge Regulator mounted on generator field frame. Relay contacts close at 480 R.P.M. with generator voltage of 6.2 volts and open with 0-2 ampere discharge current.

Contact Gap:—.015". **Air Gap:**—.010" with contacts closed.

Battery Charge Regulator is set to operate with generator voltage of 8.0 volts (cold) or 7.6 volts (hot) and reduces charging rate approximately one half by cutting resistance in field circuit (see Equipment Section for complete data on Regulator).

LIGHTING:—Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Lighting system employs new type triple filament bulbs and switch has special 'passing' position in addition to regular driving and 'depressed beam' positions.

Lamp Sizes				
Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32-32	Triple	3003
Fender Lights	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Lights	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81
Body Lights	6-8	3	S.C.	63

FUSES:—Lighting fuses mounted on block on dash are 20 ampere capacity. Generator field fuse mounted in plug on regulator cover is 3 ampere capacity.

CURRENT LIMIT RELAY:—Mounted on dash. Consists of a fixed resistance connected across a 20 ampere fuse. Resistance limits current when fuse burns out with 20 ampere current load.

PACKARD

TWELVE CYLINDER MODELS 1005, 1006 (1933) OWEN-DYNETO GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

CAR SERIAL NUMBER:—On plate on left hand front side of dash.
ENGINE NUMBER:—On left hand cylinder block under cylinder head.
ENGINE:—Twelve cylinder 67 degree 'V', modified 'L' head type, 3 7/16x4" bore and stroke, 445.5 cubic inch displacement, rated 56.7 H.P., develops 160 H.P. at 3200 R.P.M. Standard compression ratio 6.0-1. Standard compression pressure 95-100 pounds at 125 R.P.M. Optional compression ratios are not offered.

BATTERY:—Prest-O-Lite, Type A-619-ST, 6 volt, 19 plate, 144 ampere hour capacity (5 ampere rate). Starting capacity 170 amperes for 20 minutes.

Grounded Terminal:—Positive(+) terminal grounded to frame.

Mounting:—In cradle on left hand frame side rail under driver's seat.

Dimensions:—Width, 7". Length, 12 15/16". Height, 9 3/16".

IGNITION:—Coil Model CE-4020 (2 coil assembly). Two coils are assembled as a unit with the ignition switch with an armored cable on the primary lead. Coils are mounted on the dash.

Ignition Current:—6 amperes at 6 volts (engine running), 10 amperes at 6 volts (engine stopped), maximum draw for both coils.

Ignition Switch:—Electrolock, Type 15-S. Switch is assembled as unit with coils (see Equipment Section for complete data).

Distributor Model IGO-4001. Double breaker, six-lobe cam, full automatic advance type. Contacts open alternately at 33½ and 26½ degree intervals corresponding to the alternate unequal 67 and 53 degree firing intervals of the engine. Contacts must be synchronized to maintain this firing interval (see Timing).

Breaker Gap:—Set contact gap at .020". Hold within limits of .015-.020".

Breaker Arm Spring Tension:—20 ounces measured at tip of breaker arm.

Engine	Degrees	Automatic Advance	Distributor R.P.M.	Engine
0.....	Start.....	300.....	600	
6.....	3.....	450.....	900	
10.....	5.....	700.....	1400	
12.....	6.....	850.....	1700	
14.....	7.....	1050.....	2100	
16.....	8.....	1400.....	2800	

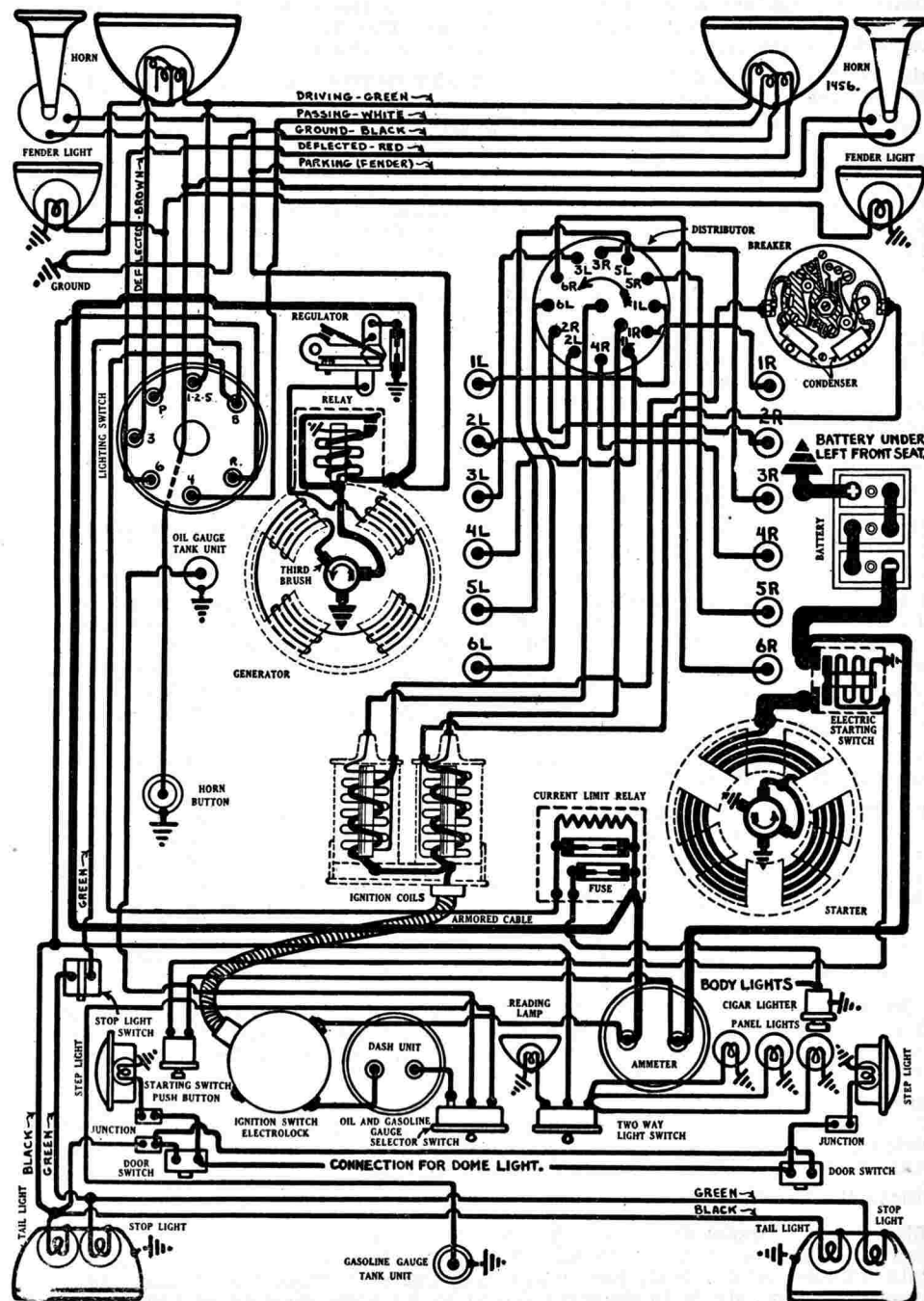
Mounting:—Distributor mounted at front of engine between cylinder banks and is driven through offset tongue-and-slot coupling from the camshaft. To remove, disconnect primary leads, take off distributor cap and spark plug cable conduits, take out screws in mounting bracket, lift out.

Oiling:—1000 Miles. Put a few drops of medium engine oil in each of two oilers on side of distributor. Breaker cam surface is oiled by wick oiler on breaker plate. This wick should be checked at 10,000-mile intervals and replaced if found to be dry.

IGNITION TIMING:—Standard Setting 7° (flywheel) or .0155" (piston travel) before top dead center.

To Set Ignition Timing. Turn engine over with No. 1R piston (No. 1 of right hand bank) on compression stroke and stop when the seventh line before the top dead center mark '1R-UDC' on the vibration dampener at the front of the engine is directly under the pointer on the chain case. Vibration dampener is marked '1R-U.D.C.' at the top dead center point with fifteen one-degree marks before this point—the seventh line or 7° mark is the ignition mark. Then loosen clamp screw on distributor mounting bracket, rotate distributor until right hand or 'fixed' contacts begin to open, tighten clamping screw. Timing of left hand or 'movable' contacts (mounted on sub-plate) which fire spark plugs in left hand block is secured by synchronizing contacts.

Synchronization of Contacts—first method. After setting timing of fixed contacts firing plugs in right hand block (above), crank engine exactly 67°



P A C K A R D

TWELVE CYLINDER MODELS 1005, 1006 (1933) OWEN-DYNETO GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

to firing position of No. 6L piston (No. 6 of the left hand block) with the seventh graduation before the top dead center mark '6L-UDC' directly under the pointer on the chain case. Then loosen lock screws on movable sub-plate, turn eccentric adjusting screw until contacts begin to open, tighten lock screws, check contact gap.

Synchronization of Contacts—second method. Synchronize contacts on a rotary spark gap and shift movable sub-plate until left hand (movable) contacts open exactly 33½ degrees after right hand (fixed) contacts, and right hand contacts open again exactly 26½ degrees after this point. This will secure the correct unequal alternate firing intervals of 37½ and 26½ degrees, corresponding to 67 and 53 degrees of crankshaft rotation.

Firing Order:—1R-6L-5R-2L-3R-4L-6R-1L-2R-5L-4R-3L with cylinder banks right (R) and left (L) as viewed from driver's seat. No. 1 cylinder in each bank nearest radiator (see diagram for Spark Plug Connections).

Spark Plugs:—14 MM. Metric. A.C. Type K-7. Set plug gaps at .025 inch.

VALVE TIMING:—Camshaft Setting. Camshaft mounted directly above crankshaft between cylinder banks and is chain driven from the crankshaft. Valves are mounted horizontally in valve alley between cylinder banks and are operated by rocker arm directly from the camshaft. An automatic valve tappet clearance take-up is used and rocker arms bear directly on valve stems with no appreciable tappet clearance in service.

To Check Valve Timing. Turn engine over until piston No. 6R is on top dead center entering power stroke with '1R-UDC' mark on vibration dampener directly under pointer on chain case. No. 1R intake valve should begin to open at this point.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 21/32"	3/4"	6 35/64"	45°	5/16"
Exhaust	1 21/32"	3/8"	6 35/64"	45°	5/16"

Tappet Clearance

Automatic tappet clearance take-up used. No clearance in service.

Valve Springs

Automatic tappet clearance take-up used. No clearance in service.

Intake Valves

Timing

Exhaust Valves

Open—At top dead center. Open 35° before lower dead center.
Close—45° after lower dead center. Close—10° after top dead center.

CARBURETION:—Stromberg Downdraft Dual Carburetor, Model EE-3 (see Carburetor Section for complete data). Stromberg Automatic Choke is standard equipment.

Air Cleaner:—A.C. oil-wetted wire mesh type. Remove unit at 2500-mile intervals, clean by dipping wire mesh end in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. combination fuel and vacuum pump (see Equipment Section for complete data). Remove glass sediment bowl under pump when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—Motometer Electric combination gasoline and oil gauge (see Equipment Section for complete data).

STARTER:—Model DN-1072. Starter drive—Outboard Bendix. Rotation counter-clockwise at commutator end. Brush spring tension 26-28 ounces. Starter is six-pole series wound motor with a single field coil so shaped that it winds around three sides of each field pole. There are four main brushes, two field lead brushes and two ground brushes each, connected in parallel. Starter cranks engine at 125 R.P.M.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	6.0	50
35 "	Lock	3.5	650

Starter Switch:—Model 21676. Electro-magnetic type mounted on starter

field frame and controlled by starting button on instrument panel. Main switch contacts are closed by switch solenoid which is controlled by starting button.

Mounting:—Sleeve mounted in right hand front face of flywheel housing. To remove, disconnect cable and switch leads or take off switch, loosen lock nut and back out large pilot mounting screw in housing directly above starter sleeve, pull starter forward to clear Bendix housing, lift out.

Oiling:—Starter bearings are oilless and require no attention.

GENERATOR:—Model CO-1119. Third brush regulation in conjunction with Battery Charge Regulator (see Equipment Section for complete data on Regulator). Rotation counter-clockwise at commutator end. Maximum charging rate 24 amperes (cold) at 8.0 volts reached at 1500 R.P.M.

Charging Rate Adjustment. Third brush shifted through rack-and-pinion control by slotted adjusting screw on endplate. To adjust charging rate, take off commutator cover, turn adjusting screw to right or clockwise to increase charging rate and to left or counter-clockwise to decrease charging rate.

Generator Data

Amperes	Volts	R.P.M.
0	6.5	475
20	7.5	1000
24	8.0	1500
13	8.0	5000

Field Fuse:—3 ampere capacity in plug in Regulator cover.

Mounting:—Generator mounted on sliding bracket at left front of engine and driven by the fan belt. To remove, disconnect lead, loosen nuts on two studs in generator mounting slide, slide generator toward engine and slip off drive belt, take off nuts and lift generator out.

Belt Adjustment. Attach spring scale by wire looped over generator frame at mounting slide. Loosen nuts on mounting studs, pull generator away from engine until scale reading is 180 pounds, tighten mounting nuts.

Oiling:—500 Miles. Few drops light engine oil in oiler at each end.

RELAY-REGULATOR:—Model 21262. Consists of relay cut-out and Battery Charge Regulator mounted in case on generator field frame. Relay contacts close at 475 R.P.M. with generator voltage of 6.5 volts and open with discharge current of 0-2 amperes.

Contact Gap:—.015". **Air Gap:**—.010" (contacts closed).

Battery Charge Regulator set to operate with generator voltage of 8.0 volts (cold) or 7.6 volts (hot) reducing charging rate approximately one-half. Regulator is compensated for temperature changes (see Equipment Section for complete data).

LIGHTING:—Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Lighting system employs new type triple filament bulbs and has third switch position for passing in addition to regular driving and depressed beam positions.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32-32	Triple	3003
Fender Lights	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Lights	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81
Body Lights	6-8	3	S.C.	63

FUSES:—Lighting fuses mounted on Current Limit Relay are 20 ampere capacity. Generator field fuse in plug on regulator case is 3 ampere capacity.

CURRENT LIMIT RELAY:—Mounted on dash. Consists of a fixed resistance connected across a 20 ampere fuse. Resistance limits current after fuse burns out with 20 ampere current.

PIERCE ARROW

EIGHT CYLINDER MODEL 836 (1933)

DELCO-REMY IGNITION

CAR SERIAL NUMBER:—On plate on right hand frame rail near right front spring rear shackle. First serial numbers this series—1,070,001 (136" W.B.), 1,550,001 (139" W.B.).

ENGINE NUMBER:—Stamped on left hand side of cylinder block at center of engine and directly below cylinder head.

ENGINE:—Eight cylinder 'in line', 'L' head type engine, $3\frac{1}{2} \times 4\frac{3}{4}$ " bore and stroke, 366 cubic inch displacement, rated at 39.2 H.P., develops 135 H.P. at 3400 R.P.M. Standard compression ratio 5.5-1. No optional compression ratios offered.

BATTERY:—Willard, Type WH-4-17, 6 volt, 17 plate, 136 ampere hour capacity (20 hour rate). Starting capacity (20 minute rate) 160 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to transmission cover.

Mounting:—In cradle under front floor boards on left hand side.

Dimensions:—Width, 7 1/16". Length, 11 11/16". Height, 9 5/16".

IGNITION:—Coil Model 537-E. Coil mounted on engine side of dash.

Ignition Current:— $\frac{1}{2}$ - $1\frac{1}{2}$ amperes at 6 volts (engine running), 4-5 amperes at 6 volts (engine stopped).

Ignition Switch:—Oakes 'Hershey' type co-incidental ignition switch and steering column lock.

Distributor Model 662-J. Two-breaker arm, 4-lobe cam, semi-automatic advance type. Manual advance controlled by button at lower right of instrument panel. Button retards distributor 33° (engine) when pulled out for hand cranking or heavy pulling. Breaker contacts open alternately at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Ignition Timing).

Breaker Gap:—Set contact gap at .018". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

Automatic Advance

Engine	Distributor	Distributor	Engine
2.....	Start.....	300.....	600
18.....	9	1550.....	3100

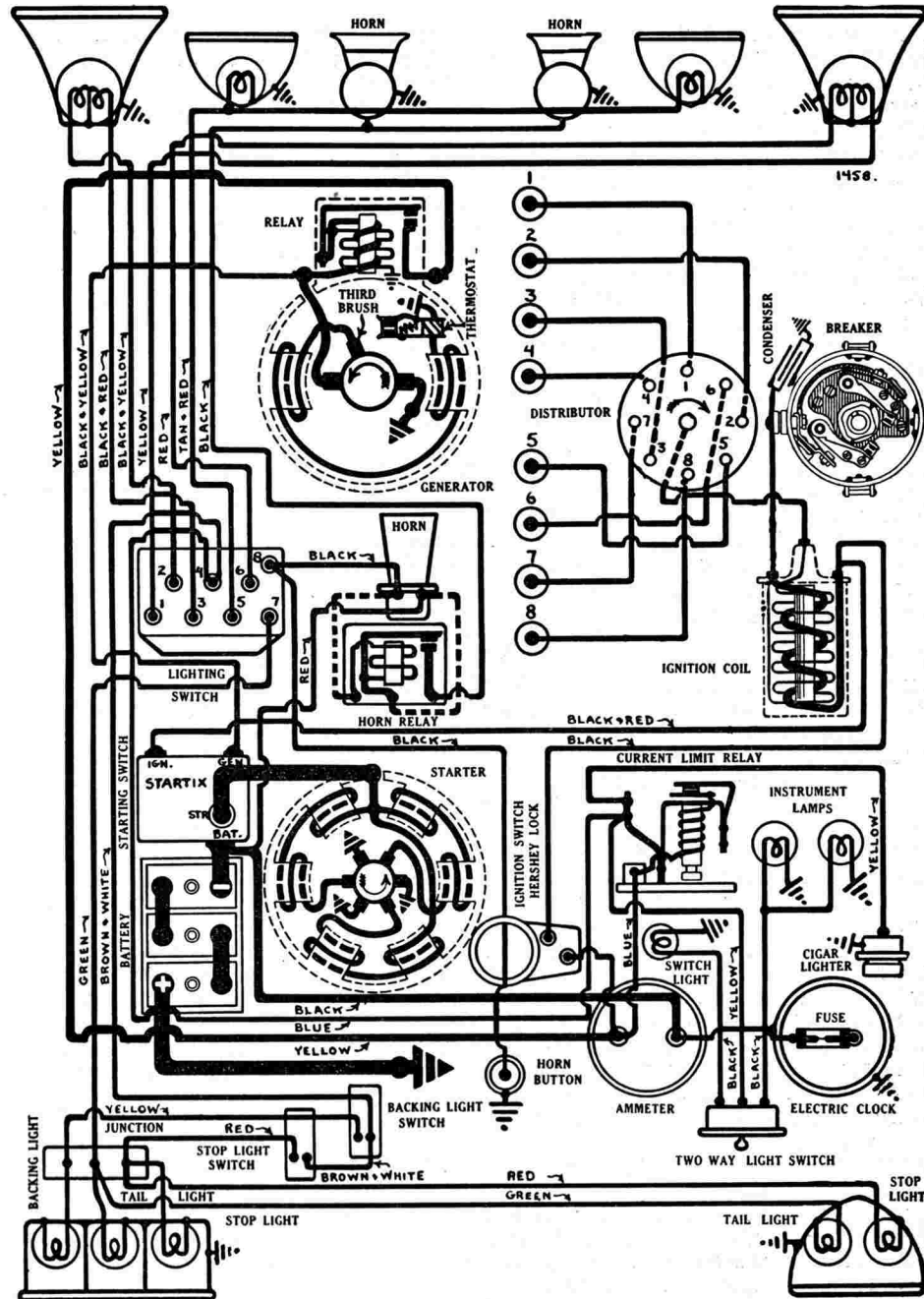
Mounting:—Distributor mounted on right hand side of cylinder head. To remove, disconnect primary lead, disconnect manual advance control, take off distributor cap, take out hold-down screw in advance arm, lift out.

Oiling:—2500 Miles. Turn down grease cup on side of shaft two turns. Keep cup filled with light cup grease. Take off distributor turn cap and rotor, put 8-10 drops engine oil in wick oiler in center of shaft, oil breaker arm pivot pins, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard Setting— 5° before top dead center with manual control fully advanced.

To Set Ignition Timing:—Take off cover plate over inspection hole in flywheel housing, fully advance spark control button (push button in toward dash), disconnect and tape wire on 'IGN' terminal of Startix to avoid automatic cranking. With No. 4 piston on compression turn engine over until flywheel mark 'IGN/5-4' (which is 5° before top dead center mark 'UDC/5-4') is directly opposite indicator on housing, loosen advance arm clamp bolt, rotate distributor cup until first set of contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt, see that rotor is opposite No. 4 terminal in distributor cap (see diagram), connect spark plugs as indicated. Then synchronize contacts to time second set (mounted on breaker sub-plate).

Synchronization of Contacts:—**First Method.** Turn engine over 90° or $\frac{1}{4}$ revolution to firing position of piston No. 1 with flywheel mark 'IGN/1-8' (which is 5° before top dead center mark 'UDC/1-8') at indicator, loosen lock screws on movable sub-plate (carrying second set of breaker contacts), turn eccentric adjusting screw until contacts begin to open, tighten locking screws.



PIERCE ARROW

EIGHT CYLINDER MODEL 836 (1933)

DELCO-REMY IGNITION

Synchronzation—Second Method. Use special Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:— $\frac{7}{8}$ -18 S.A.E. Std. Champion Type C-45. Set spark plug gaps at .025 inch. Hold within limits of .025-.030 inch.

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine and driven from crankshaft by two-sprocket non-adjustable chain drive. Sprockets are marked and chain should be meshed with sprockets turned so that marks are adjacent and in line with a straightedge laid across the shaft centers.

To Check Valve Timing. With piston No. 8 entering power stroke, turn engine over until flywheel mark 'IN.OP./1-8' (which is 5° after top dead center mark 'UDC/1-8') registers with indicator on flywheel housing. With .010 inch tappet clearance No. 1 intake valve should begin to open at this point. An automatic valve tappet clearance take-up is used and there will ordinarily be no tappet clearance in service (see note below).

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 21/32" (overall)	.3725"	4 3/4"	45°	.359"
Exhaust	1 9/16" (overall)	.3715"	4 3/4"	45°	.359"

Tappet Clearance

None in service—.010" for timing.
See note below.

Valve Springs

Closed—60-64 pounds—2 1/16".
Open—120-125 pounds—1 3/4".

NOTE:—The automatic hydraulic valve tappet clearance take-up is built into the valve lifter, operates entirely automatically, and requires no adjustment or attention. The valve lifter is built in two parts with the upper section (which is contact with the valve stem) forming a piston in the hollow lower part. Oil under pressure is forced into the upper part of the lifter and flows through a ball-check valve into the chamber between the two sections forcing the upper section into contact with the valve stem. A small coil spring assists in this operation. The ball-check valve prevents oil escaping when the entire lifter is forced up by the cam to open the valve.

Timing

Intake Valves		Exhaust Valves	
Open 5° after top dead center.		Open 40° before lower dead center.	
Close 45° after lower dead center.		Close 12° after top dead center.	

CARBURETION:—Stromberg Downdraft Carburetor, Model EE-3 (see Carburetor Section for complete data). Automatic manifold heat control and Stromberg Automatic Choke with built-in 'fast-idle' standard equipment.

Air Cleaner:—A.C. oil-wetted wire mesh type. Remove air cleaner at 2000-3000 mile intervals, clean by dipping in pan of gasoline, thoroughly dry, re-oil by dipping in engine oil, drain before reassembling.

Fuel Pump:—Stewart-Warner mechanical fuel pump mounted at right rear of crankcase (see Equipment Section for complete data). Remove glass sediment bowl occasionally, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—K.S. Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model 497. Six-pole type. Starter drive—Outboard Bendix drive with Startix automatic starting switch. See Equipment Section for complete data on Startix. Rotation counter-clockwise at commutator end. Brush spring tension 36-40 ounces on each brush.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	5.0	70
19 "	Lock	3.0	500

Mounting:—Three cap screw flange mounting on left hand side of front face of flywheel housing. To remove, disconnect cable, take out flange mounting screws, pull starter forward to clear Bendix housing, lift out.

Oiling:—Starter bearings are oilless.

GENERATOR:—Model 927-V. Third brush regulation with thermostat control. Thermostat contacts open at 165°F. reducing charging rate approximately 40%. Rotation counter-clockwise at commutator end. Maximum charging rate 20 amperes (cold) at 8.5 volts reached at 1600 R.P.M.

Charging Rate Adjustment:—Take off commutator cover band, loosen small round lock screw on end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test		Hot Test	
Amperes	Volts	Amperes	Volts
20-22	8.5-8.7	12-14	7.6-7.9
	1600		1800

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—1.8-2.3 amperes at 6 volts across field terminals.

Motoring:—Approximately 3.5 amperes at 6 volts.

Mounting:—Cradle mounted at left front of engine with fan belt drive (double Vee belt). Generator drives water pump through shaft extension and coupling. To remove, disconnect lead, disconnect water pump coupling, slack off fan belt adjustment, loosen mounting clamp band, lift out.

Belt Adjustment:—To adjust belt, loosen clamp bolt on fan bracket, turn eccentric shaft spindle until belt slippage is taken out, tighten clamp bolt. Additional adjustment secured by taking off bracket, moving bracket up until mounting bolts engage lower holes and then making final adjustment on the eccentric shaft spindle.

Oiling:—2500 Miles. Put 8-10 drops engine oil in oiler at each end.

RELAY:—Model 265-G. Mounted on generator field frame. Contacts close with generator voltage of 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Delco-Remy Switch, Model 487-C, 487-E (Custom Models). Lighting switch mounted at lower end of steering column and controlled by left hand lever on steering wheel. Lighting system Guide 'Multi-beam' providing special asymmetrical passing beam with standard double filament bulbs.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Auxiliary Lights	6-8	6	S.C.	81
Dash Lights	6-8	3	S.C.	63
Tail and Tonneau Lights	6-8	6	S.C.	81
Stop and Backing Lights	6-8	21	S.C.	1129
Dome Light	6-8	15	S.C.	87

CURRENT LIMIT RELAY:—Model 410-F. Vibrating circuit breaker in lighting circuit. Starts to operate with current load of 30-35 amperes limiting load to 5-18 amperes with direct short-circuit.

Contact Gap:—.012-.030 inch. **Air Gap:**—.015-.025 inch (contacts closed).

Spring Tension:—5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

HORNS:—E.A. Vibrator type horns mounted under auxiliary headlights. Current draw 7 amperes at 6 volts each.

Klaxon Model K-26E, Type 1485 (low note), 1486 (high note) may be used on standard models and Type 1489 (low note), 1490 (high note) matched tone twin horns with Horn Relay Model 266-T on custom models. Current draw 6.0-8.5 amperes (Types 1485, 1489), 5.0-6.5 amperes (Types 1486, 1490) at 6 volts.

Horn Relay Model 266-T. Requires .25 ampere to close relay contacts. Horn current does not pass through horn button. Relay contact gap limits .015-.025". Air gap limits .012-.017" with contacts closed.

CLOCK:—Electric type mounted at left center of instrument panel. There is a 5 ampere capacity fuse mounted on the back of the clock.

PIERCE ARROW

TWELVE CYLINDER MODELS 1236, 1242, 1247 (1933)

DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—Stamped on plate on right hand frame side rail near right front spring rear shackle. First serial numbers as follows:
Model 1236:—136" W.B.—2,075,001. 139" W.B.—2,575,001.
Model 1242:—137" W.B.—3,100,001. 142" W.B.—3,525,001.
Model 1247:—142" W.B.—3,525,001. 147" W.B.—3,550,001.

ENGINE NUMBER:—Stamped on upper right rear side of crankcase.
ENGINE:—Twelve cylinder, 80° 'V' type, 'L' head engine. Model 1238— $3\frac{3}{8} \times 4$ " bore and stroke, 429 cubic inch displacement, rated at 54.6 H.P., develops 160 H.P. at 3400 R.P.M. Models 1242 and 1247— $3\frac{1}{2} \times 4$ " bore and stroke, 462 cubic inch displacement, rated at 58.8 H.P., develops 175 H.P. at 3400 R.P.M. Standard compression ratio 6.0-1. No optional compression ratios offered.

BATTERY:—Willard, Type WH-5-19, 6 volt, 19 plate, 153 ampere hour capacity (20 hour rate). Starting capacity (20 minute rate) 180 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to transmission cover.
Mounting:—In cradle under front floor boards on left hand side.

Dimensions:—Width, 7 1/16". Length, 13". Height, 9 3/4".

IGNITION:—Coil Model 537-E (2 used). Coils mounted on engine side of dash.

Ignition Current:— $\frac{1}{2}$ -1 1/2 amperes at 6 volts (engine running), 4-5 amperes at 6 volts (engine stopped) for each coil.

Ignition Switch:—Oakes 'Hershey' type co-incidental ignition switch and steering column lock located on steering column at instrument board.

Distributor Model 4105. Two breaker arm, 6-lobe cam, semi-automatic advance type. Manual advance controlled by button at lower right of instrument panel. Spark button retards distributor 33° (engine) when pulled out for hand cranking or heavy pulling. Breaker contacts open at 20° and 40° intervals corresponding to 40° and 80° firing intervals of engine—the engine has an included angle between cylinder banks of 80° resulting in unequal firing intervals between cylinders in opposite banks. Contacts must be synchronized (see Ignition Timing).

Breaker Gap:—Set contact gap at .018". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

Engine	Distributor	Distributor	R.P.M.	Engine
2	Start	400		800
14	7	1400		2800

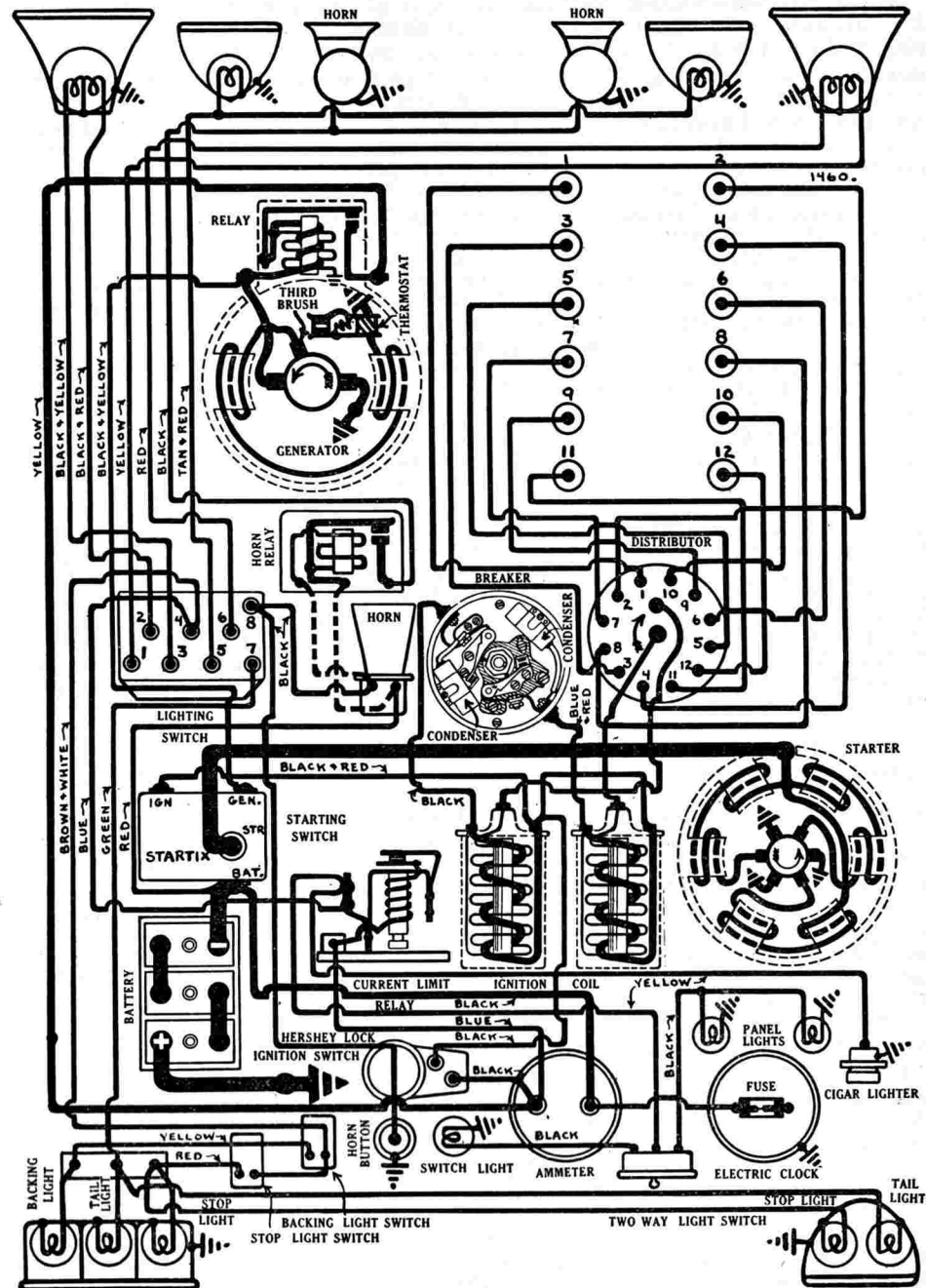
Mounting:—Mounted at extreme rear of engine between cylinder banks. To remove, disconnect primary leads, take off distributor cap, disconnect manual spark control, take out distributor mounting bracket screws, lift out.

Oiling:—2500 Miles. Turn down grease cup on side of shaft two turns. Keep cup filled with light cup grease. Put 8-10 drops engine oil in oiler. Take off distributor cap and rotor, put 8-10 drops oil on breaker cam locking screw, oil breaker arm pivot pins, apply thin film vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting, 5° before top dead center with manual control fully advanced.

To Set Ignition Timing:—Take off cover plate over inspection hole in flywheel housing, fully advance manual spark control (push button in toward dash), disconnect and tape wire on 'IGN' terminal of Startix to prevent automatic cranking. With No. 1 piston on compression (No. 1 of left hand block), turn engine over until flywheel mark 'IGN.#1/' (which is 5° before top dead center mark 'UDC/No.1') is directly opposite pointer on flywheel housing, take off distributor cap and rotor, loosen locking screw in center of breaker cam, carefully locate cam so that first set of contacts (fixed set—mounted directly on breaker plate) are beginning to open, tighten locking screw. See that spark plugs are connected as shown on diagram. Then synchronize contacts to time second set (movable set—mounted on breaker sub-plate).

Synchronization of Contacts—First Method. After timing distributor (above), turn engine over 40° or approximately $\frac{1}{8}$ revolution to firing position of piston No. 4 (No. 2 of right hand bank) with flywheel mark 'IGN/#4' (which is 5° before top dead center mark 'UDC/No.4') directly opposite indicator on housing, loosen lock screws on movable sub-plate carrying second set of contacts, shift plate by turning eccentric adjusting screw until contacts begin to open, tighten locking screws.



PIERCE ARROW

TWELVE CYLINDER MODELS 1236, 1242, 1247 (1933)

DELCO-REMY SYSTEM

Synchronization of Contacts—Second Method. Synchronize contacts on rotary spark gap and shift movable sub-plate until the set of contacts mounted on it open 20° after fixed set. The fixed set of contacts (mounted directly on breaker plate) should open 40° after this point. This will give the correct unequal firing interval of 20-40-20 degrees.

Firing Order:—1-4-9-8-5-2-11-10-3-6-7-12 with cylinders numbered as shown on diagram or 1L-2R-5L-4R-3L-1R-6L-5R-2L-3R-4L-6R with cylinder banks right (R) and left (L) as viewed from driver's seat and No. 1 cylinder nearest the radiator.

Spark Plugs:—14 MM. Metric. Champion Type JN-5. Set gaps at .022-.025".

VALVE TIMING:—**Camshaft Setting.** Camshaft directly above crankshaft and driven by two-sprocket non-adjustable chain drive. Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge laid across the shaft centers.

To Check Valve Timing:—With piston No. 11 on compression stroke turn engine over until flywheel mark 'IN.OP.#1/' (which is 4° or 19° before top dead center mark 'UDC./No.1') is directly opposite indicator on flywheel housing. With .004" tappet clearance, No. 1 intake valve should begin to open at this point. An automatic valve tappet take-up is used and there will ordinarily be no tappet clearance in service. See Valve Timing paragraph on Model 836 for complete description of this device. There is an additional mark 'IN.OP.#4' (which is 4° or 19° before the top dead center mark UDC./No.4') to indicate the intake opening point for cylinder No. 4.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 21/32" (overall)	.3725"	4 3/4"	45°	.312"
Exhaust	1 9/16" (overall)	.3715"	4 3/4"	45°	.312"

NOTE:—Install all valves with .002-.003" stem clearance in guides.

Tappet Clearance

Automatic hydraulic take-up used. Close—60-64 pounds—2 1/16".
No tappet clearance in service. Open—120-125 pounds—1 3/4"

Valve Springs

Valve Timing—First 68 Cars, Model 1236

Intake valves—Open 4° before top dead center. Close 52° after lower dead center.

Exhaust valves—Open 40° before lower dead center. Close 16° after top dead center.

Valve Timing—After First 68 Cars, Model 1236, All 1242 and 1247

Intake valves—Open 19° before top dead center. Close 69° after lower dead center.

Exhaust valves—Open 56° before lower dead center. Close 28° after top dead center.

CARBURETION:—Two Stromberg Downdraft Carburetors, Model EX-3. One carburetor used for each cylinder bank with inter-connected throttle controls and a single air cleaner (see Carburetor Section for complete data). Automatic manifold heat control and Stromberg Automatic Choke with built-in 'fast idle' standard equipment.

Air Cleaner:—A.C. oil-wetted wire mesh type. Remove at 2000-3000 mile intervals by unscrewing two thumb nuts at front of unit, clean by dipping in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before re-assembling.

Fuel Pump:—Stewart-Warner Mechanical Fuel Pump mounted at left rear of crankcase (see Equipment Section). Remove glass sediment bowl under pump occasionally, empty water and sediment, clean filter screen (located above sediment bowl) before reassembling.

Gasoline Gauge:—K.S. Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model 498. Six-pole type. Starter drive—Outboard Bendix drive with Startix automatic starting switch (see Equipment Section for complete data on Startix). Rotation counter-clockwise at commutator end. Brush spring tension 36-40 ounces on each brush.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	5.0	70
19 "	Lock	3.0	500

Mounting:—Three cap screw flange mounting on right hand front face of flywheel housing. To remove, disconnect cable, take out flange mounting screws, pull starter forward to clear Bendix housing.

Oiling:—Starter bearings are oilless.

GENERATOR:—Model 927-V. Third brush regulation with thermostat control. Thermostat contacts open at 165°F. reducing charging rate approximately 40%. Rotation counter-clockwise at commutator end. Maximum charging rate 20 amperes (cold) at 8.5 volts reached at 1600 R.P.M.

Charging Rate Adjustment:—Take off commutator cover band, loosen small round lock screw on end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
20-22	8.5-8.7	1600	12-14	7.6-7.9	1800

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—1.8-2.3 amperes at 6 volts across field terminals.

Motoring:—Approximately 3.5 amperes at 6 volts.

Mounting:—Cradle mounted at left front of engine with fan belt drive (double Vee belt). Generator drives water pump through shaft extension and coupling. To remove, disconnect lead, disconnect water pump coupling, slack off fan belt adjustment, loosen mounting clamp band, lift out.

Belt Adjustment:—To adjust belt, loosen clamp bolt on fan bracket, turn eccentric shaft spindle until belt slippage is taken out, tighten clamp bolt. Additional adjustment secured by taking off bracket, moving bracket up until mounting bolts engage lower holes and then making final adjustment on the eccentric shaft spindle.

Oiling:—2500 Miles. Put 8-10 drops engine oil in oiler at each end.

RELAY:—Model 265-G. Mounted on generator field frame. Contacts close with generator voltage of 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Delco-Remy Switch, Model 487-C, 487-E (Custom Models). Lighting switch mounted at lower end of steering column and controlled by left hand lever on steering wheel. Lighting system Guide 'Multi-beam' providing special asymmetrical passing beam with standard double filament bulbs.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Auxiliary Lights	6-8	6	S.C.	81
Dash Lights	6-8	3	S.C.	63
Tail and Tonneau Lights	6-8	6	S.C.	81
Stop and Backing Lights	6-8	21	S.C.	1129
Dome Light	6-8	15	S.C.	87

CURRENT LIMIT RELAY:—Model 410-F. Vibrating circuit breaker in lighting circuit. Starts to operate with current load of 30-35 amperes limiting load to 5-18 amperes with direct short-circuit.

Contact Gap:—.012-.030 inch. **Air Gap:**—.015-.025 inch (contacts closed).

Spring Tension:—5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

HORNS:—E.A. Vibrator type horns mounted under auxiliary headlights. Current draw 7 amperes at 6 volts each.

Klaxon Model K-26E, Type 1485 (low note), 1486 (high note) may be used on standard models and Type 1489 (low note), 1490 (high note) matched tone twin horns with Horn Relay Model 266-T on custom models. Current draw 6.0-8.5 amperes (Types 1485, 1489), 5.0-6.5 amperes (Types 1486, 1490) at 6 volts.

Horn Relay Model 266-T. Requires .25 ampere to close relay contacts. Horn current does not pass through horn button. Relay contact gap limits .015-.025". Air gap limits .012-.017" with contacts closed.

CLOCK:—Electric type mounted at left center of instrument panel. There is a 5 ampere capacity fuse mounted on the back of the clock.

PLYMOUTH

NEW SIX MODEL PC (1933), SERIAL NUMBERS 1,759,001 UP
STANDARD SIX MODEL PC (1933), SERIAL NUMBERS 1,817,101 UP
DE LUXE MODEL PD (1933), SERIAL NUMBERS 2,000,001 UP
DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On right front door hinge pillar post. First number 1,759,001.

ENGINE NUMBER:—Stamped on boss on left side cylinder block between Nos. 1 and 2 cylinders.

ENGINE:—Six cylinder, 'L' head type, $3\frac{1}{8} \times 4\frac{1}{8}$ " bore and stroke, 189.8 cubic inch displacement, rated at 23.43 H.P., develops 70 H.P. at 3600 R.P.M. (standard compression engine) or 76 H.P. at 3600 R.P.M. (high compression Red Head engine). Standard compression ratio (Silver Dome Head), 5.5-1. Optional high compression ratio (Red Head engine) 6.5-1. A distinct ignition setting is used for each type engine (see Timing).

BATTERY:—Willard, Type WS.-1-13, 6 volt, 13 plate, 86 ampere hour (20 hour rate). Starting capacity 105 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to transmission.

Mounting:—Battery mounted in cradle under driver's seat.

Battery Dimensions:—Width, 7 $\frac{1}{16}$ inches. Length, 9 $\frac{1}{16}$ inches. Height, 8 $\frac{13}{16}$ inches.

IGNITION:—Coil Model 537-T, 537-W. Mounted on engine side of dash.

Ignition Current:—1-2 amperes at 6 volts (engine running), 3-4 amperes at 6 volts (engine stopped).

Ignition Switch:—Unit with coil. Switch mounted on instrument board and connected to coil by armored primary lead (see Equipment Section).

Distributor Model 622-H (first cars), 644-H (later cars). Single breaker arm, 6-lobe cam type with full automatic advance. Condenser mounted on outside of distributor cup.

Breaker Gap:—Set gap at .020 inch. Hold within limits of .018-.024 inch.

Spring Tension:—Breaker arm spring tension, 19-23 ounces (measured at point directly behind contacts with spring scale at right angles to back of breaker arm).

Automatic Advance—Model 622-H

Engine	Degrees	Distributor	Distributor	R.P.M.	Engine
2	Start	400	800		
17.5	8.75	1100	2200		
18	9	1200	2400		

Automatic Advance—Model 644-H

0	Start	275	550
25	12½	1175	2250

Mounting:—Distributor mounted on left side of crankcase and driven by inclined shaft from camshaft. To remove, disconnect breaker lead, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

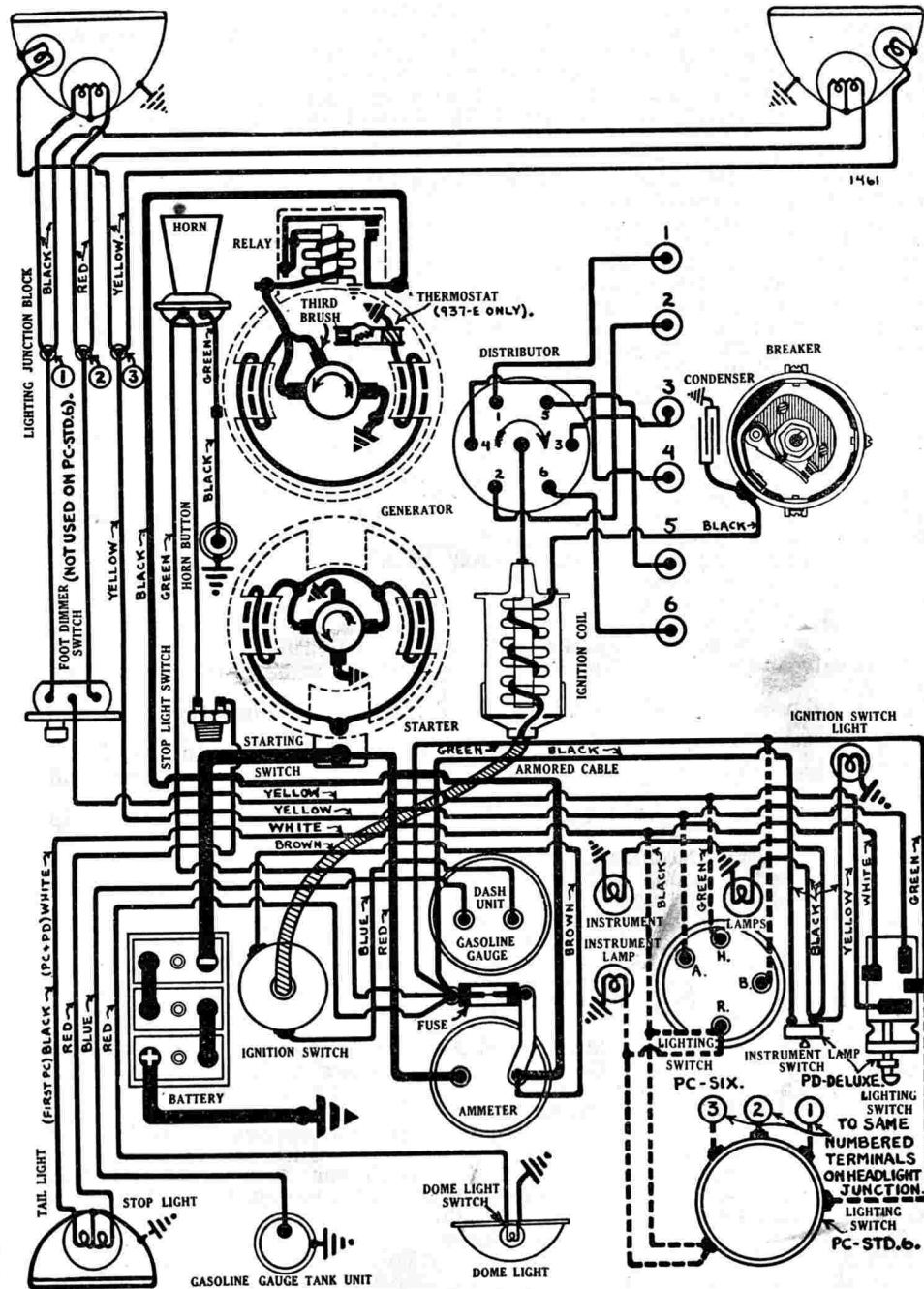
Oiling:—500 Miles. Turn down grease cup on side of housing one turn. Keep cup filled with medium cup grease.

2000 Miles. Take off distributor cap and rotor. Oil breaker arm pivot and fill wick oiler in center of shaft. Apply thin film vaseline on face of breaker cam.

IGNITION TIMING:—Standard setting for each engine and each type distributor as follows:

Engine	Distributor	Timing—Flywheel°	Piston Travel
Silver Dome Head	622-H	10° before TDC.	.039" before TDC.
Silver Dome Head	644-H	At top dead center.	Top dead center.
Red Head Engine	622-H	8° before TDC.	.025" before TDC.
Red Head Engine	644-H	At top dead center.	Top dead center.

To Set Ignition Timing:—Set breaker contact gap at .020 inch. Take off cover on inspection hole in left front face flywheel housing (directly under starter). With No. 1 piston on compression turn engine over until flywheel mark 'DC' lines up with upper pointer in inspection hole. Loosen advance arm clamp screw, rotate distributor cup until contacts begin to open (use a test lamp), tighten clamp screw, see that rotor is opposite No. 1 terminal in distributor cap (see diagram) and connect spark plugs as indicated.



PLYMOUTH

NEW SIX MODEL PC (1933), SERIAL NUMBERS 1,759,001 UP
STANDARD SIX MODEL PC (1933), SERIAL NUMBERS 1,817,101 UP
DE LUXE MODEL PD (1933), SERIAL NUMBERS 2,000,001 UP
DELCO-REMY SYSTEM

Note on Ignition Pointer. For cars timed before top dead center a second pointer (located above the dead center pointer) is installed on the edge of the inspection hole. This pointer is correctly set for both standard and high compression engines when high compression head is installed at the factory. On engines timed at top dead center this separate ignition pointer is not used.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—14 MM. Metric. A.C. Type K-12 (standard compression engines), Type K-10 (Red Head engines). Set spark plug gaps at .025 inch.

VALVE TIMING:—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive. Sprockets are marked. Mesh chain so that, with No. 1 piston on top dead center, marks on both sprockets are adjacent and in line with a straightedge laid across the shaft centers.

To Check Valve Timing. Install timing gauge in cylinder head over No. 6 piston and set gauge dial at zero on top dead center. Set tappet clearance No. 1 intake valve at .011" and No. 1 exhaust valve at .012" with engine cold. With No. 6 piston on compression turn engine over until gauge registers .014" past top dead center. No. 1 intake valve should be opening with all tappet clearance taken up. No. 1 exhaust valve closes 2° later when gauge registers .025". Reset tappet clearance at .005" (intake) and .007" (exhaust) with engine warm.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	.1 15/32"	.340-.341"	4 25/32"	45°	5/16"
Exhaust	.1 15/32"	.340-.341"	4 25/32"	45°	5/16"

Tappet Clearance

	Operating	Timing	Closed—34-38 pounds (1 3/4")—PD.
Intake	.005" (hot)	.011" (cold)	Closed—40-44 pounds (1 25/32")—P.C.
Exhaust	.007" (hot)	.012" (cold)	Open—75-81 pounds.

Valve Springs

Valve Grinding:—Valve material chrome-nickel steel (intake), silchrome steel (exhaust). Special alloy exhaust valve seat inserts in cylinder block. Valves should be refaced on a valve grinder and then lapped in block. Ordinary reseating tool can not be used on exhaust valve seat inserts. These must be ground when necessary. Install valves with .001-.003" stem clearance in guide (intake), .003-.005" (exhaust). Valve stem guides removable.

Intake Valves

Timing

Exhaust Valves

Open 6° after top dead center. Open 42° before lower dead center.
 Close 46° after lower dead center. Close 8° after top dead center.

CARBURETION:—Carter Down Draft Carburetor, Model C-6-A or C-6-A-2 (see Carburetor Section for complete data). Manifold heat control automatic.

Air Cleaner:—Copper mesh type integral with silencer. Remove complete unit every 2,500 miles, take off top plate containing felt pad (held in place by knurled nut), remove dirt from cleaner unit by dipping in gasoline, dry thoroughly, re-oil by dipping in S.A.E. No. 50 heavy oil and drain off excess oil before re-installing.

Fuel Pump:—A.C. Mechanical Fuel Pump mounted on right side of crankcase (see Equipment Section for complete data). Remove sediment bowl on pump, empty water and sediment, clean filter screen (directly above bowl) when necessary.

Gasoline Gauge:—Motometer electric type (see Equipment Section for complete data).

STARTER:—Model 734-H. Starter drive—overrunning clutch and manual pinion shift connected to starting switch pedal. Rotation counter-clockwise at commutator end. Brush spring tension, 24-28 ounces each.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5.0	65

Mounting:—Two-capscrew flange mounting at left of engine on front face of flywheel housing. To remove, disconnect cable and pedal linkage, take out flange cap screws, pull starter forward to clear drive pinion, lift out.

GENERATOR:—Model 943-S (standard), 937-E (cars with radio). Third brush regulation, thermostat control (937-E only). Thermostat contacts open at 175°F. reducing output approximately 40%. Rotation counter-clockwise at commutator end. Manufacturer recommends charging rate set at 8 amperes (10 amperes on cars with radio), maximum charge to battery as shown on dash ammeter with all lights on and car operated at speed of 20-22 M.P.H.

Charging Rate Adjustment:—Take off commutator cover band, loosen small lock screw on end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten lock screw.

Generator Data—Model 943-S

Standard Setting			Maximum Output		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
Cold .....16-17.....	7.9-8.2.....	2000	Cold .....19-21.....	8.1-8.3.....	2300
Hot .....13-15.....	7.7-8.0.....	2400	Hot .....13-15.....	7.7-8.0.....	2400

Generator Data—Model 937-E

Cold .....20-22.....	8.2-8.4.....	2100	Cold .....22-24.....	8.4-8.6.....	2400
Hot .....12-14.....	7.7-8.0.....	2800-3000	Hot .....12-14.....	7.7-8.0.....	2800-3000

Brush Spring Tension:—24-28 ounces on each brush.

Field Current:—3.5-4.5 amperes at 6 volts across field terminals.

Mounting:—Pivot mounting on bracket at left front of engine and driven by fan belt. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine and lift off drive belt, take out two bolts forming bracket hinge, lift out.

Belt Adjustment:—To take up fan belt, loosen mounting bolts and adjustment clamp bolt, attach spring scale by wire looped over generator field frame so that force of spring is tangent to top of generator and parallel to adjustment arm slot. Pull generator away from engine until spring scale reading is 45-50 pounds, tighten adjustment bolt and mounting bolts before slacking off on scale.

RELAY:—Model 265-G. Mounted on generator field frame. Contacts close at 8-10 M.P.H. or approximately 800 R.P.M. with generator voltage of 6.75-7.5 volts. Contacts open with discharge current of 0-2.5 amperes.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Lighting switch is mounted on back of instrument board and is controlled by button on instrument panel. Double filament bulbs are used for 'depressed beam' dimming and are controlled by lighting switch (Standard Six), or by foot-operated dimmer switch mounted on the toe-board (First Six and De Luxe Models). Dimmer switch is Delco-Remy Model 465-Z.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21	D.C.	1116
Parking Bulbs	6-8	3	S.C.	63
Instrument Light	6-8	3	S.C.	63
Stop and Tail Light	6-8	21-2	D.C.	1158
Dome Light	6-8	15	S.C.	87

NOTE:—Stop and tail light bulb is a double filament bulb and tail light lead (black braid) must be connected to 2 cp. filament. Stop light switch (hydraulic type) is screwed in forward end of brake master cylinder.

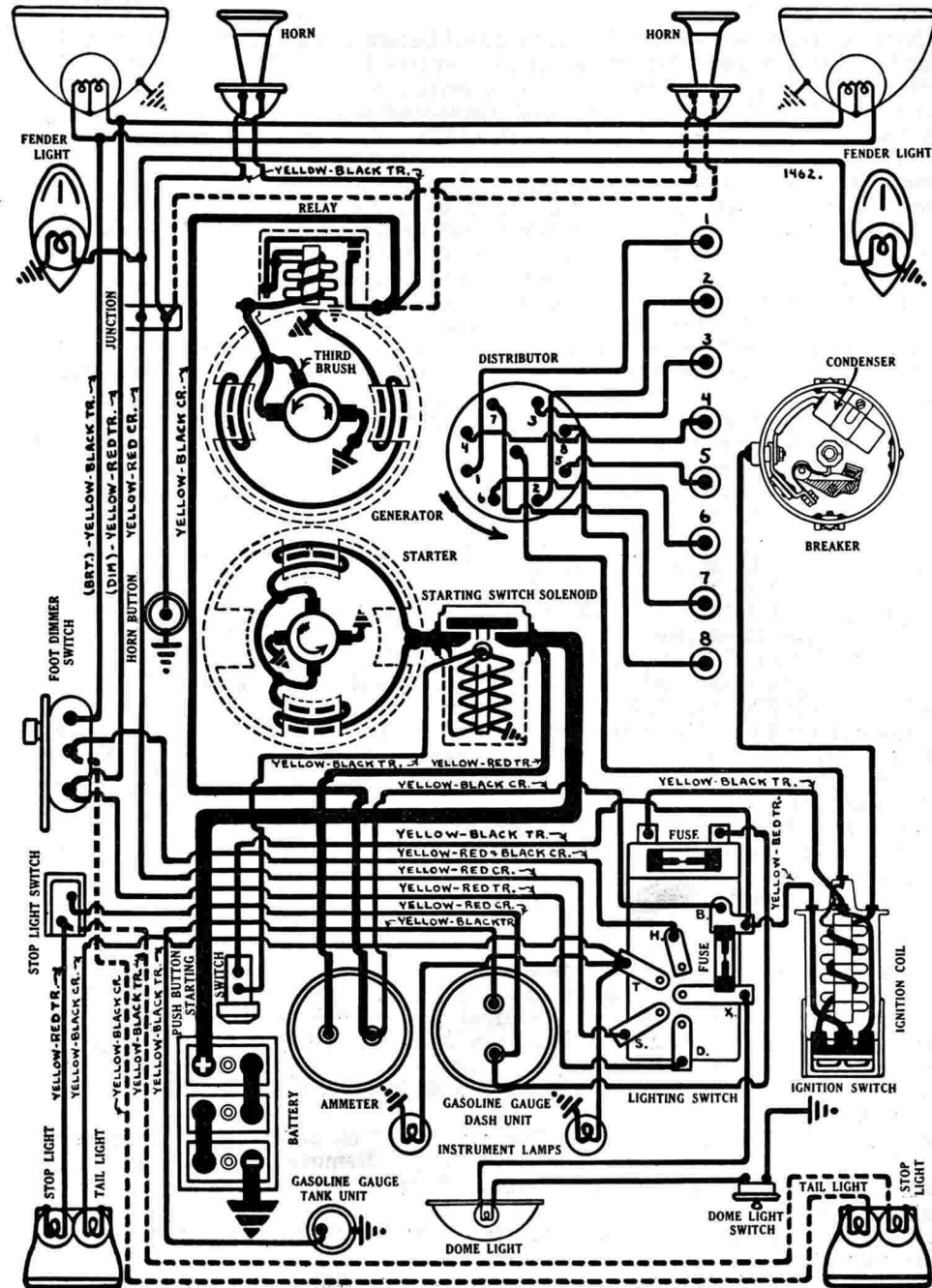
FUSES:—One 20 ampere capacity, mounted on back of ammeter.

HORNS:—Klaxon Model K-31, vibrator type, standard equipment. Model K-26 matched set optional equipment. Current drawn by horns, 4.0-6.5 amperes at 6 volts (Model K-31), 5.0-6.5 amperes at 6 volts (Model K-26 high note),

**EIGHT CYLINDER MODEL 601 (1933), SERIAL NUMBERS 770001 UP
DELCO-REMY SYSTEM**

Degrees	Automatic Advance		R.P.M.
Eng'ne	Distributor	Distributor	Engine
2.....	Start.....	300.....	600
26.....	13	1800.....	3600

Spark Plugs:—14 MM. Metric. A.C. Type K-10. Set gaps at .018-.023".



PONTIAC

EIGHT CYLINDER MODEL 601 (1933), SERIAL NUMBERS 770001 UP DELCO-REMY SYSTEM

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine and driven by two-sprocket non-adjustable chain drive from crankshaft. Both sprockets are marked. Mesh chain with marks on sprockets adjacent and in line with straightedge laid across shaft centers.

To Check Valve Timing. With piston No. 1 on top dead center entering power stroke, set tappet clearance No. 1 exhaust valve at .010 inch. Turn engine over one complete revolution and stop with flywheel mark '1-8/E.C.' (which is 5° after top dead center mark 'UDC/1&8') at indicator on housing in inspection hole in left front face of flywheel housing. No. 1 exhaust valve should close at this point.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1.406"	.3105"	30°	9/64"
Exhaust	1.343"	.3105"	45°	9/64"

Tappet Clearance

	Operating	Timing	
Intake	.009-.011" (warm)	.010"	Closed 45-51 pounds
Exhaust	.009-.011" (warm)	.010"	Open 74-82 pounds

Valve Springs

Intake Valves	Timing	Exhaust Valves
Open—5° before top dead center.		Open—45° before lower dead center.
Close—39° after lower dead center.		Close—5° after top dead center.

CARBURETION:—Carter Downdraft Carburetor, Model W-1, Types 255-S and 266-S (see Carburetor Section for complete data). Manifold heat control automatic.

Air Cleaner:—Oil-wetted wire gauze type. Remove at 2000-mile intervals, take off felt silencer pad, clean wire gauze by dipping in gasoline, dry thoroughly re-oil by dipping in engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical type mounted at right front of crankcase (see Equipment Section for complete data). Remove sediment bowl on pump when necessary, empty water and sediment, clean filter screen (directly above bowl) before reassembling.

Gasoline Gauge:—A.C. Electric type (see Equipment Section for complete data).

STARTER:—Model 734-G. Starter drive—Bendix. Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5.0	65
12 "	Lock	3.63	475

Starter Switch:—Delco-Remy Solenoid Model 1503. Electric starting switch is mounted on starter field frame and connected to starter terminal by busbar. Switch is controlled by push button at lower left center of instrument panel.

Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, disconnect wiring on starting switch, take out two flange mounting cap screws, pull starter straight forward to clear Bendix, lift out.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in commutator end oiler.

GENERATOR:—Model 937-B. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate 17 amperes (cold) at 8.2 volts reached at 2000 R.P.M.

Charging Rate Adjustment. Loosen small round lock screw on end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test		R.P.M.	Hot Test	
Amperes	Volts		Amperes	Volts
16-18	8.05-8.25	2000	11-13	7.5-7.8
				2000-2100

Brush Spring Tension:—14-18 ounces on each brush.

Field Current:—3.5-4.5 amperes at 6 volts across field terminals.

Motoring:—Approximately 5 amperes at 6 volts.

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, slip off drive belt, take out bolts forming bracket hinge, lift generator out.

Belt Adjustment. Loosen adjustment clamp bolt and mounting bolts, pull generator away from engine until proper belt tension is secured, tighten adjustment clamp bolt before slacking off on generator, tighten mounting bolts.

Oiling:—1000 Miles. Put 8-10 drops light engine oil in oiler at each end.

RELAY:—Model 265-G. Mounted on generator field frame. Contacts close when generator voltage reaches 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025". Air Gap:—.012-.017" (contacts closed).

LIGHTING:—Delco-Remy Lighting Switch, Model 487-Z. Dimmer Switch Model 465-Z, Y. Lighting switch mounted on back of instrument board and operated by push-pull button on instrument panel. Double filament headlight bulbs are used for 'depressed beam' dimming and are controlled by foot-operated switch on toeboard.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21	D.C.	1116
Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tail Lights	6-8	3	S.C.	63
Stop Lights	6-8	3	S.C.	63
Dome Light	6-8	3	S.C.	63

FUSES:—Three 20 ampere capacity fuses mounted on lighting switch bracket in back of instrument board. One fuse is connected in lighting circuits. Fuse on end of switch is connected in gasoline gauge and stop light circuit. Third fuse (nearest instrument board) is a spare.

HORNS:—Klaxon Model K-26, Type 1415 (low note), Type 1416 (high note) matched tone twin horns are mounted under headlights. Current draw 6.0-8.5 amperes at 6 volts (Type 1415), 5.0-6.5 amperes at 6 volts (Type 1416).

R E O

FLYING CLOUD SIX MODEL S-2 (1933)

DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On top of left frame side rail near steering gear.

ENGINE NUMBER:—Stamped on left hand upper front corner of cylinder block.

ENGINE:—Six cylinder, 'L' head type, $3\frac{3}{8} \times 5$ " bore and stroke, 268 cubic inch displacement, rated at 27.3 H.P., develops 85 H.P. at 3200 R.P.M. Standard compression ratio 5.30-1. No optional high compression ratios are offered.

BATTERY:—Willard, Type WH-1-13, 6 volt, 13 plate, 102 ampere hour capacity (20 hour rate). Starting capacity 120 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—On bracket under front floor boards at left of transmission.

Dimensions:—Width, $7\frac{1}{16}$ ". Length, $9\frac{1}{16}$ ". Height, $9\frac{5}{16}$ ".

IGNITION:—Coil Model 536-S. Coil mounted on dash. Assembled as unit with ignition switch (primary lead protected by armored cable).

Ignition Current:—2.0 amperes at 6 volts (engine running), 4 amperes at 6 volts (engine stopped).

Ignition Switch:—Electrolock, Type 16-S. Assembled as unit with coil. Switch has two 'on' positions, both to right of vertical 'off' position. On cars equipped with Startix (optional), turn key to first 'on' position (approximately $\frac{1}{8}$ turn to right) for timing or when automatic cranking is not desired. Regular running position (key turned to extreme right) is with both ignition and Startix operative.

Distributor Model 644-M. Single breaker, 6-lobe cam, semi-automatic advance type. Manual advance is controlled by button on instrument board. Maximum manual advance is 25° (engine).

Breaker Gap:—Set contact gap at .022". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
2.....	2.....	Start.....	300.....	600	
18.....	9.....	1450.....	2900		

Mounting:—Distributor mounted on right hand side of cylinder head. To remove, disconnect primary lead, disconnect manual spark control, take off distributor cap, take out hold-down screw in advance arm, lift out.

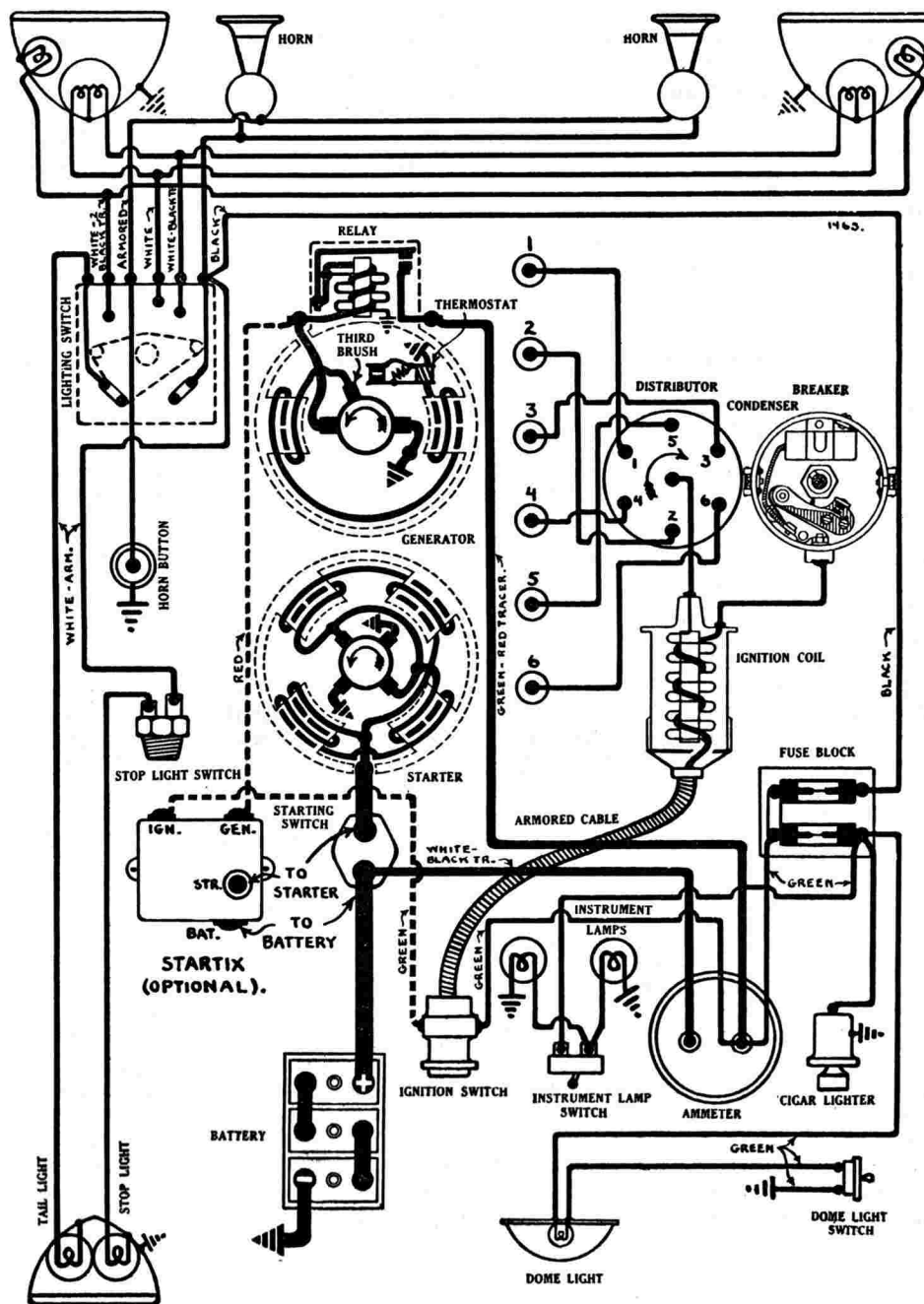
Oiling:—1000 Miles. Turn down grease cup on side of shaft housing two full turns. Keep cup filled with No. 2½ cup grease. Take off distributor cap and rotor, put 5 drops of light engine oil in wick oiler in center of shaft, put one drop oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting—1" or two teeth (flywheel), or .012" (piston travel) before top dead center with manual spark control advanced.

To Set Ignition Timing. Fully advance manual spark control, take off cover plate over inspection hole in right rear motor support leg. With No. 1 piston on compression, turn engine over by hand until piston reaches firing position when a point on the flywheel 1" or two full teeth before the top dead center mark 'UDC.#1' is opposite the indicator on the flywheel housing. Then loosen clamp bolt in advance arm, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 segment in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set spark plug gaps at .025 inch.



R E O

FLYING CLOUD SIX MODEL S-2 (1933)

DELCO-REMY SYSTEM

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is driven by two-sprocket non-adjustable chain drive. Sprockets are marked. To set timing, with crankshaft turned so that piston No. 1 is on top dead center and camshaft turned so that No. 1 intake valve is about to open with .012" tappet clearance, mesh sprockets in chain so that '0' marks on sprockets are adjacent and in line with a straightedge laid across the shaft centers. Then mount camshaft sprocket on camshaft flange. One mounting cap screw hole is offset so that sprocket can only be mounted in correct position. This cap screw is used as a dowel to locate sprocket and must be inserted first. Before installing chain case cover see that spring plunger on camshaft sprocket (which controls camshaft endplay) is in place.

To Check Valve Timing. With piston No. 1 on top dead center entering power stroke, set tappet clearance of No. 1 intake valve at .012". Turn engine over one complete revolution and stop with piston on top dead center with flywheel mark 'UDC.#1' at indicator in inspection hole in flywheel housing at right of engine. No. 1 intake valve should begin to open at this point. Reset tappet clearance at .007" with engine warm.

Valve Specifications

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 13/16"	.3437"	5 3/4"	45°	5/16"
Exhaust	1 13/16"	.3437"	5 3/4"	45°	5/16"

Tappet Clearance

	Operating	Timing	
Intake	.007" (hot)	.012" cold.	Closed
Exhaust	.007" (hot)		58-60 pounds.

Valve Springs

Intake Valves	Timing	Exhaust Valves
Open—At top dead center.		Open—48° before lower dead center.
Close—50° after lower dead center.		Close—2° after top dead center.

CARBURETION:—Stromberg Downdraft Carburetor, Model EX-32 with Stromberg Automatic Choke (see Carburetor Section for complete data). Manifold heat control is automatically operated by thermostatic spring.

Air Cleaner:—Oil-wetted wire mesh type integral with silencer. Remove complete unit when necessary, take off top cover and felt silencer pad, clean by dipping wire mesh unit in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical type mounted on right side of crankcase (see Equipment Section for complete data). Remove glass sediment bowl under pump occasionally, empty water and sediment, clean filter screen above bowl before reassembling.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model 718-H. Starter drive—Bendix drive. Standard starting switch Model 405-C mounted on toeboard. Startix automatic starting switch is optional (see diagram for Startix connections). Complete data on Startix is given in Equipment Section. Starter rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5.0	65
15 " "	Lock	3.15	570

Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, disconnect cable, take out 3 flange mounting cap screws, pull starter forward to clear Bendix drive, lift out.

Oiling:—1000 Miles. Put 5 drops light engine oil in commutator end oiler. Drive end bearing is oilless.

GENERATOR:—Model 955-R. Third brush regulation, thermostatic control. Thermostat contacts open at 165°F. reducing charging rate approximately 40%. Rotation counter-clockwise at commutator end. Maximum charging rate is 20 amperes (cold) at 8.3-8.5 volts reached at 1450 R.P.M.

Charging Rate Adjustment. Loosen small round lock screw on commutator end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.3-8.5	1450	9-12	7.3-7.6	1800-2000

Brush Spring Tension:—14-18 ounces on each brush.

Field Current:—4.0-6.1 amperes at 6 volts across field terminals.

Motoring:—Approximately 5 amperes at 6 volts.

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine and slip off drive belt, take out two bolts forming bracket hinge under generator, lift out.

Belt Adjustment. To take up fan belt, loosen adjustment clamp bolt and mounting bolts, swing generator away from engine, tighten adjustment clamp bolt before slacking off on generator. Belt should be just tight enough to drive generator and fan without slipping.

Oiling:—1000 Miles. Put 5 drops of light engine oil in oiler at each end.

RELAY:—Model 265-B. Mounted on generator field frame. Contacts close with generator voltage of 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025". Air Gap:—.012-.017" with contacts closed.

LIGHTING:—Delco-Remy Switch, Model 486-X. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Double filament headlight bulbs are used for 'depressed beam' dimming and are controlled by lighting switch.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	3	S.C.	63

FUSES:—Fuses on fuse block in back of instrument board panel under cowl are 20-ampere capacity.

HORNS:—Klaxon Model K-26, Type 1507 (low note), 1508 (high note), matched tone twin horns. Current draw of horns 6.0-8.5 amperes at 6 volts (Type 1507), 5.0-6.5 amperes at 6 volts (Type 1508).

REO

ROYALE EIGHT, MODEL N-2 (1933)

DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On top of left hand frame side rail near steering gear.

ENGINE NUMBER:—Stamped on front left hand engine support.

ENGINE:—Eight cylinder 'in line', 'L' head type, $3\frac{3}{8} \times 5$ " bore and stroke, 358 cubic inch displacement, rated at 36.48 H.P., develops 135 H.P. at 3300 R.P.M. Standard compression ratio 5.3-1. No optional high compression ratios offered.

BATTERY:—Willard, Type RH-4-17, 6 volt, 17 plate, 136 ampere hour capacity (20 hour rate). Starting capacity 160 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—In box on left hand side of car under driver's seat.

Dimensions:—Width, 7 $\frac{1}{16}$ ". Length, 11 $\frac{11}{16}$ ". Height, 9 $\frac{5}{16}$ ".

IGNITION:—Coil Model 536-T. Coil mounted on dash. Assembled as unit with ignition switch (primary lead protected by armored cable).

Ignition Current:—2.0 amperes at 6 volts (engine running), 4 amperes at 6 volts (engine stopped).

Ignition Switch:—Electrolock, Type 16-S. Assembled as unit with coil. Switch has two 'on' positions both to right of vertical 'off' position. On cars equipped with Startix (optional), turn key to first 'on' position (approximately $\frac{1}{8}$ turn to right) for timing or when automatic cranking is not desired. The second 'on' position (key turned to extreme right) is the regular running position with ignition on and Startix operative.

Distributor Model 660-K. Two breaker, 4 lobe cam, semi-automatic advance type. Breaker contacts open alternately at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Timing). Manual advance controlled by 'Spark' button at left of instrument panel. Normal running position is with button pushed in toward dash (distributor advanced 25° engine). Pulling out button retards spark for hand cranking or heavy pulling.

Breaker Gap:—Set contact gap at .022". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

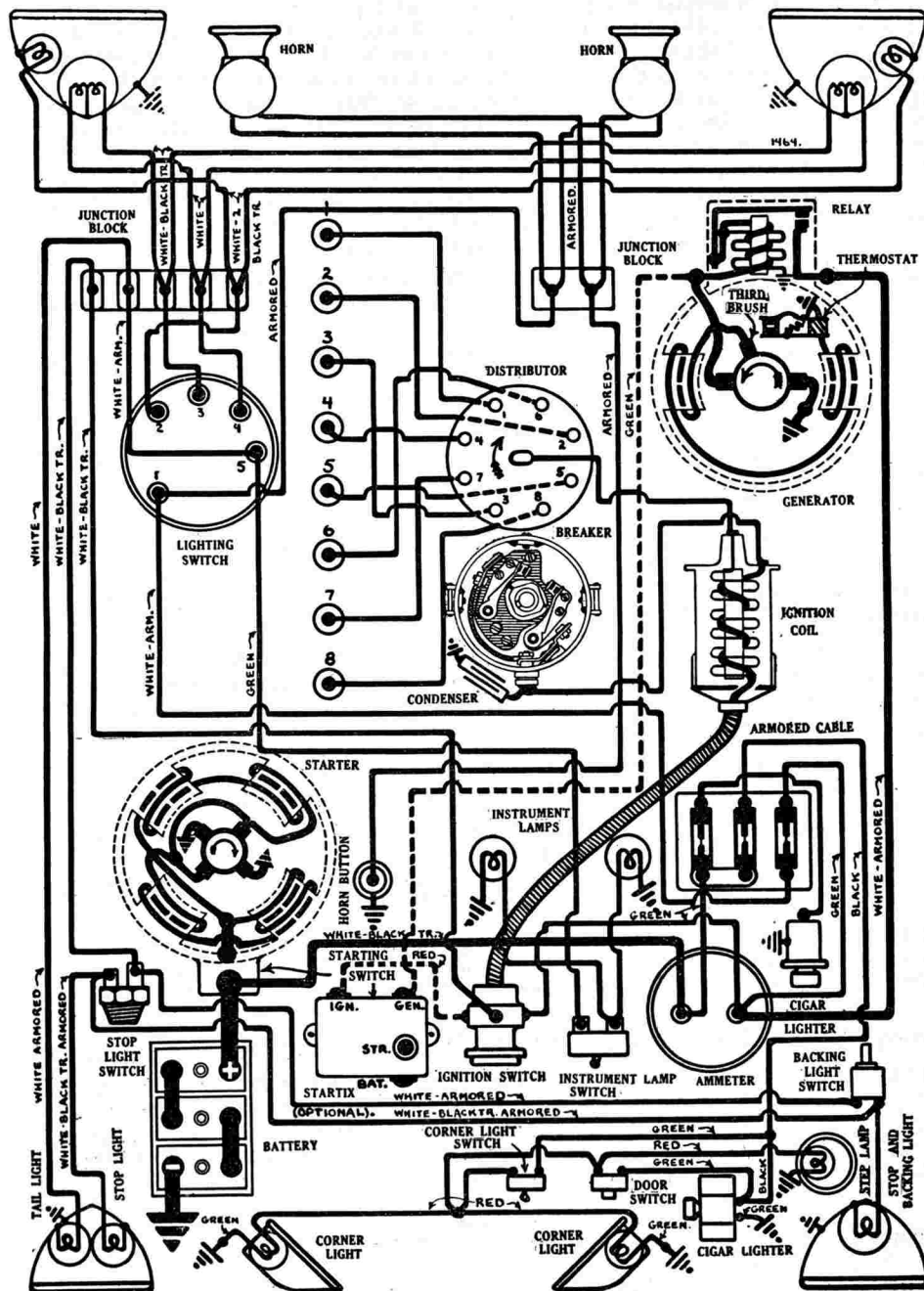
Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start		400		800
22	11		1600		3200

Mounting:—Distributor mounted on right hand side of cylinder head. To remove, disconnect primary lead, disconnect manual spark control, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

Oiling:—1000 Miles. Turn down grease cup on side of shaft housing two turns. Keep cup filled with medium cup grease. Take off distributor cap and rotor, oil wick oiler in center of shaft with light engine oil, put one drop of oil on breaker arm pivot pins, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting, $\frac{3}{4}$ " (flwheel) or .014" (piston travel) before top dead center with manual spark control fully advanced.

To Set Ignition Timing. Fully advance manual spark control (push button in toward dash) and see that distributor is rotated counter-clockwise to limit of advance arm slot, take off cover plate over inspection hole in top of flywheel housing. With No. 1 piston on compression stroke, turn engine over by hand until piston reaches firing position with the ignition mark on the flywheel (which is $\frac{3}{4}$ " before the UDC. mark) directly under the reference mark on the edge of the inspection hole. Then loosen clamp bolt in advance arm, rotate distributor until first or 'fixed' set of contacts (mounted directly on breaker plate) begin to open; tighten clamp bolt, see that rotor is directly opposite No. 1 segment in distributor cap, connect spark plugs as indicated. The second or 'movable' set of contacts must then be synchronized.



. R E O

ROYALE EIGHT, MODEL N-2 (1933)

DELCO-REMY SYSTEM

Synchronization of Contacts. No marks on flywheel are provided for synchronization of contacts directly on the engine. Special Delco-Remy synchronizing tool, Part No. 1838182, must be used. See Equipment Section for complete data on Synchronization of Contacts. If timing gauge is used to time engine and special adaptor is available so that gauge can be mounted in No. 6 cylinder, contacts can be synchronized by turning engine to firing position of No. 6 piston (.014" before top dead center—this position is exactly 90° or ¼ revolution after firing position of piston No. 1). Then loosen lock screws on movable sub-plate (on which second set of contacts are mounted), turn eccentric adjusting screw until contacts begin to open, tighten locking screws.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set gaps at .025 inch.

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine is driven by chain from the crankshaft in tandem with generator sprocket. Engine front supports are on timing chain cover and it is necessary to remove radiator and engine hood and take off wiring, fuel connections, exhaust pipe and controls, and jack up front end of engine before chain case cover can be removed. Sprockets are marked. To set timing, with crankshaft turned so that piston No. 1 is on top dead center and camshaft turned so that No. 1 intake valve is about to open with .012" tappet clearance, mesh chain so that marks on sprockets are directly opposite and in line with a straight-edge across the shaft centers.

To Check Valve Timing. With No. 1 piston on top dead center entering power stroke, set tappet clearance of No. 1 intake valve at .012". Turn engine over one complete revolution and stop with piston top dead center with flywheel 'UDC' mark directly under indicator on edge of inspection hole in top of flywheel housing. No. 1 intake valve should begin to open at this point. Reset tappet clearance at .008" with engine warm.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 13/16"	.3437"	5 3/4"	45°	11/32"
Exhaust	1 11/16"	.3437"	5 3/4"	45°	11/32"

Tappet Clearance

Operating Timing		Valve Springs	
Intake	.008" (hot) .012" (cold)	Closed	60 pounds—2 3/8"
Exhaust	.008" (cold)	Open	80 pounds—2 1/32"

Timing

Intake Valves		Exhaust Valves	
Open	At top dead center.	Open	48° before lower dead center.
Close	50° after lower dead center.	Close	2° after top dead center.

CARBURETION:—Schebler Duplex Updraft Carburetor. See Carburetor Section for complete data. Manifold heat control and choke are controlled manually by buttons on the dash.

Fuel Pump:—A.C. Mechanical type fuel pump mounted on right hand side of crankcase and driven by eccentric on camshaft. Remove glass sediment bowl under pump occasionally, empty water and sediment, clean filter screen (located directly above sediment bowl) before reassembling.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—**Model 728-M, 724-W (Startix R.H.D.).** Starter drive, reduction gears and overrunning clutch with mechanical pinion shift connected to starting switch pedal linkage (728-M), or reduction gears and Bendix drive (724-W). Startix automatic starting switch is optional equipment. See diagram for connections of Startix switch. Complete data is given in Equipment Section on Startix. Rotation of armature shaft is clockwise at commutator end. Brush spring tension is 24-28 ounces.

Starter Data—Model 728-M			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5.0	70
28 "	Lock	3.0	600
Starter Data—Model 724-W			
0 lb. ft.	3500	5.0	70
22 "	Lock	3.0	600

Mounting:—Flange mounted on left hand forward face of flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage (728-M only), take out 3 flange mounting cap screws, pull starter forward to clear pinion housing, lift out.

Oiling:—1000 Miles. Put 5-6 drops light engine oil in oiler at each end of armature.

5000 Miles or Six Months. Take out grease plug in reduction gear case and repack gears with graphite grease.

GENERATOR:—**Model 955-G.** Third brush regulation, thermostat control. Thermostat contacts open at 165°F. reducing charging rate approximately 40%. Rotation is counter-clockwise at commutator end. Maximum charging rate is 20 amperes (cold) at 8.4 volts reached at 1450 R.P.M. or 25 M.P.H.

Charging Rate Adjustment. Loosen small round lock screw on commutator end plate, take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.3-8.5	1450	9-12	7.3-7.6	1800-2000

Brush Spring Tension:—14-18 ounces on each brush.

Field Current:—4.0-6.1 amperes at 6 volts across field terminals.

Motoring:—Approximately 5 amperes at 6 volts.

Mounting:—Flange mounted on right hand rear face of timing chain case. To remove, disconnect lead, take out flange mounting screws, pull generator to rear to disengage drive coupling, lift out. Generator is driven through tongue-and-slot coupling by accessory sprocket which is mounted independently in chain case. Do not crank engine with generator out.

Timing Chain Adjustment. Loosen flange mounting screws, pull generator away from engine until chain is tight, tighten mounting screws, run engine to check adjustment. If chain hums, adjustment is too tight and engine should be stopped and chain backed off slightly. Mounting screws should not be loosened with engine running. With correct adjustment chain should run noiselessly.

Oiling:—1000 Miles. Put 5-6 drops light engine oil in oiler at each end.

RELAY:—**Model 265-B.** Mounted on generator field frame. Relay contacts close at approximately 575 R.P.M. or 8-10 M.P.H. when generator voltage reaches 6.75-7.5 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025". **Air Gap:**—.012-.017" with contacts closed.

LIGHTING:—**Delco-Remy Switch Model 482-F.** Lighting switch mounted at lower end of steering column and controlled by lower lever on steering wheel. Double filament headlamp bulbs are used for 'depressed beam' dimming and are controlled by lighting switch.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Backing and Stop Lights	6-8	15	S.C.	87
Corner and Step Lights	6-8	3	S.C.	63

FUSES:—Fuses on fuse block under cowl directly in back of instrument board are 20 ampere capacity.

HORNS:—Klaxon Model K-18-C twin horns are standard equipment. Current draw, 5.5-6.5 amperes at 6 volts (each).

ROCKNE

SIX CYLINDER MODEL 10 OR 31 (1933), SERIAL NUMBERS 16,151 UP AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—On plate on frame side rail under left hand front fender.

ENGINE NUMBER:—Stamped on cylinder block at left center above distributor.

ENGINE:—Six cylinder, 'L' head type, $3\frac{1}{8} \times 4\frac{1}{8}$ bore and stroke, 189.8 cubic inch displacement, N.A.C.C. rating—23.4 H.P., develops 70 H.P. at 3200 R.P.M. Standard compression ratio 5.5-1, no optional compression ratios available.

BATTERY:—Willard, Type WH-1-13, 6 volt, 13 plate, 102 ampere hour capacity (20 hour rate). Starting capacity 120 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded.

Mounting:—Battery mounted under front floor boards on left hand side.

Dimensions:—Width, $7\frac{1}{16}$ ". Length, $9\frac{1}{16}$ ". Height, $9\frac{5}{16}$ ".

IGNITION:—Coil Model IG-4304. Lock coil type mounted on back of instrument board.

Ignition Current:—5-2.5 amperes at 6 volts (engine running), 4-5 amperes at 6 volts (engine stopped).

Ignition Switch:—Ignition switch has two 'On' positions. With key turned to the right (regular running position), Startix is operative. With key turned to the left (timing position), ignition is on but Startix is not connected.

Distributor Model IGB-4070-A. Single breaker arm, 6 lobe cam, full automatic advance type. No manual advance provided. To set breaker gap, loosen lock nut on stationary contact mounting stud, turn up stud, tighten lock nut.

Breaker Gap:—Set gap at .020". Hold within limits of .018-.020".

Breaker Arm Spring Tension:—16-22 ounces (measured at tip of breaker arm with spring scale in line with center of contacts and at right angles to breaker arm).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
0	Start	Distributor	Distributor	800
6	3	400	550	1100
12	6	700	1000	1400
16	8	1200	2000	2000
18.2	9.1	1400	2400	2400
21	10.5	1400	2800	2800

Mounting:—Distributor mounted at left center of engine and driven by inclined shaft from camshaft. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance arm, lift out.

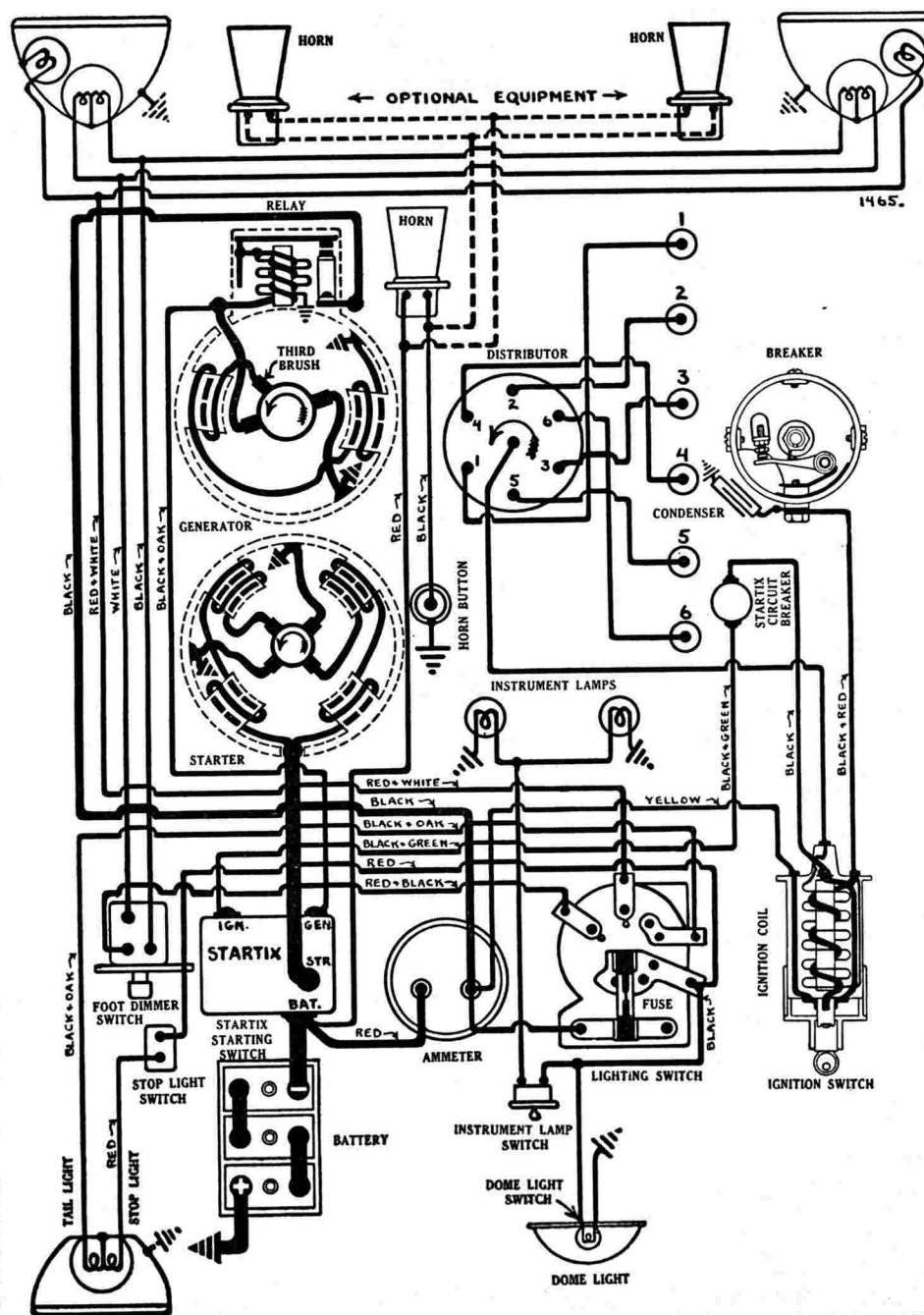
Oiling:—1000 Miles. Put few drops of light engine oil in oiler on side of distributor shaft housing. Take off distributor cap and rotor, oil wick oiler in center of shaft, put one drop oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting—Top dead center with automatic advance retarded.

To Set Ignition Timing:—With No. 1 piston on compression turn engine over until piston reaches top dead center with flywheel mark 'U.D.C. 1-6' directly opposite pointer in inspection hole on left hand forward face of flywheel housing under the starter. Loosen advance arm clamp bolt, rotate distributor cup until contacts begin to open (if ignition is turned on to check contact opening, use left hand 'On' position of switch to avoid automatic cranking), tighten clamp bolt, see that rotor is opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion No. 7. Set spark gaps at .025 inch.



ROCKNE

SIX CYLINDER MODEL 10 OR 31 (1933), SERIAL NUMBERS 16,151 UP
AUTO-LITE SYSTEM

VALVE TIMING:—Camshaft Setting. Camshaft driven from crankshaft by two-sprocket non-adjustable chain drive. Both sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with straightedge across shaft centers.

To Check Valve Timing:—Set tappet clearance No. 1 intake valve at .010" cold. With No. 6 piston on compression turn engine over until flywheel mark 'IN.O.P./1-6' (which is 5° or 1/2" before top dead center mark 'U.D.C./1-6') registers with pointer in inspection hole in flywheel housing. No. 1 intake valve should begin to open at this point. Reset tappet clearance at .004" with engine warm.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 15/32" (overall)	11/32"	4 11/16"	45°	5/16"
Exhaust	1 9/32" "	11/32"	4 11/16"	45°	5/16"

Tappet Clearance

Operating Timing

Intake	.004" (hot) .010" (cold)	Closed	48-53 pounds	2 1/32"
Exhaust	.006" (hot) .010" (cold)	Open	71-76 pounds	1 23/32"

NOTE:—Install all valves with .001-.003" valve stem clearance in guide.

Intake Valves

Timing

Exhaust Valves

Open 5° before top dead center. Open 40° before lower dead center.
Close 40° after lower dead center. Close 5° after top dead center.

CARBURETION:—Stromberg Updraft Carburetor, Model UR-2 (see Carburetor Section for complete data). Intake manifold heat control is manually operated.

Fuel Pump:—A.C. mechanical fuel pump mounted on right side of crancase (see Equipment Section). Remove sediment bowl whenever necessary, empty water and sediment, remove filter screen (directly above bowl) and clean screen before reassembling.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model MAJ-4030. Starter drive. Outboard Bendix drive and Startix switch. See Equipment Section for complete data on Startix and special Startix circuit breaker (Anti-backfire unit). Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces each. Starter cranks engine at 140 R.P.M. (1580 R.P.M. of armature) drawing 170 amperes.

Starter Data

Torque	R.P.M.	Volts	Amperes
.3 lb. ft.	2500	5.5	100
2.25 "	1460	5.0	200
4.6 "	960	4.5	300
7.3 "	575	4.0	400
10.3 "	225	3.5	500
12.6 "	Lock	3.0	575
19.0 "	Lock	4.0	800

Mounting:—Two-capscrew flange mounting on left hand forward face of flywheel housing. To remove, disconnect cable, take out 2 flange mounting screws, pull starter straight forward to clear Bendix housing, lift out.

Oiling:—1000 Miles. Put few drops light engine oil in oiler at each end of armature. Outer bearing (in end of Bendix housing) is oilless.

GENERATOR:—Model GAM-4501. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate (standard setting), 18 amperes (cold) at 8.0 volts reached at 2400 R.P.M. or 22-24 M. P. H.

Charging Rate Adjustment:—Take off commutator cover band, shift third brush (by prying on brush mounting stud) counter-clockwise to increase, or clockwise to decrease charging rate. Third brush is held in position by friction.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	700	0	6.4	760
4	6.9	880	4	6.9	1040
7	7.0	1000	8	7.3	1400
10	7.2	1180	10	7.5	1600
14	7.8	1520	12.8	7.9	2550
18	8.0	2400	12.2	7.8	3200
15.2	7.9	3200			

Brush Spring Tension:—18-22 ounces on each brush.

Shunt Field Current:—4.08-4.52 amperes at 6 volts across field terminals.

Motoring:—4.94-5.46 amperes at 6 volts.

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine and slip off drive belt, take out two bolts forming bracket hinge, lift generator out.

Belt Adjustment. Loosen mounting bolts and adjustment clamp bolt, pull generator away from engine until belt can just be turned with fan held stationary, tighten adjustment bolt before releasing generator, tighten hinge bolts.

Oiling:—1000 Miles. Put few drops light engine oil in oiler at each end.

RELAY:—Model CB-4022. Mounted on generator field frame. Contacts close at 750 R.P.M. of generator or 7 M.P.H. with generator voltage of 7-7.5 volts and open with discharge current of .5-2.5 amperes.

Contact Gap:—.025-.035 inch. **Air Gap:**—.010-.030 inch (contacts closed).

LIGHTING:—Clum Switch, Model 9236. Clum Dimmer Switch, Model 9126. Lighting switch mounted behind instrument board and controlled by push-pull button on instrument panel. Lighting system 'depressed beam' with double filament headlight bulbs controlled by foot-operated switch on toe-board. Lighting switch positions:

1. Button pushed in—All lights off.
2. Button pulled out halfway—Headlights and tail light on.
3. Button pulled out—Parking bulbs (in headlamps) and tail light on.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Light	6-8	21-2	D.C.	1158
Dome Light	6-8	6	S.C.	81

NOTE:—Stop and tail light equipped with double filament bulb. Tail light lead (black and oak wire) must be connected to 2 cp. filament.

FUSE:—20 ampere capacity mounted on back of lighting switch.

HORNS:—Sparton vibrator type mounted under left hand headlight. Two horns furnished as special equipment. Current draw, 6 amperes at 6 volts.

STUDEBAKER

SIX MODEL 56 (1933) SERIAL NUMBERS 5,133,401 UP
DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On plate on frame side rail under left hand front fender. First number this series 5,133,401.

ENGINE NUMBER:—Stamped on front center of engine block directly behind water pump.

ENGINE:—Six cylinder, 'L' head type, $3\frac{1}{4} \times 4\frac{5}{8}$ " bore and stroke, 230 cubic inch displacement, rated at 25.4 horsepower, develops 85 hp. at 3200-3600 R.P.M. Standard compression ratio—5.5-1. Optional high compression head (6.0-1) available but not recommended by factory. Standard compression pressure, 105 pounds at 1200 R.P.M.

BATTERY:—Willard, Type WH-1-13, 6 volt, 13 plate, 102 ampere hour (20 hour rate). Starting capacity, 120 amperes for 20 minutes.

Ground Terminal:—Positive (+) terminal grounded to frame side rail.

Mounting:—Battery mounted in cradle under driver's seat.

Dimensions:—Width, $7\frac{1}{16}$ ". Length, $9\frac{1}{16}$ ". Height, $9\frac{5}{16}$ ".

IGNITION:—Coil Model 537-X. Lock coil type mounted on back of instrument board.

Ignition Current:— $\frac{1}{2}$ - $1\frac{1}{2}$ amperes at 6 volts (engine running), 4-5 amperes at 6 volts (engine stopped).

Distributor Model 622-A. Single breaker arm, six lobe cam, semi-automatic advance type with manual retard and vacuum 'Spark Modifier'. Spark control button at left of instrument panel retards distributor 15° (engine) when pulled out for hand cranking or heavy pulling.

Spark Modifier Model 680-D:—Consists of spring-loaded vacuum operated diaphragm mounted on spark advance plate and connected to secondary plate directly underneath. It is designed to momentarily retard spark (up to 6°) whenever engine is quickly accelerated to eliminate spark knock. It requires no attention.

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

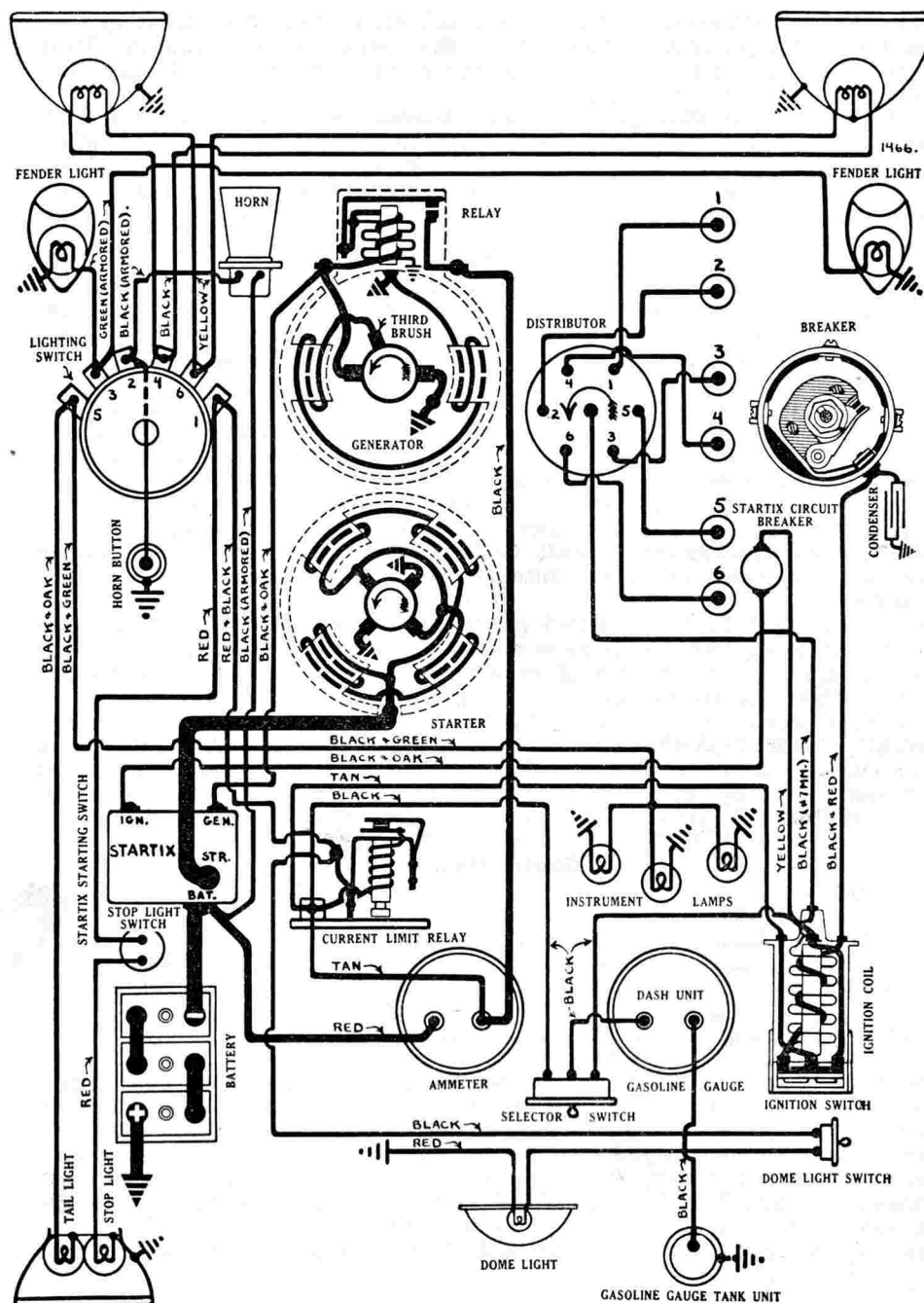
Degrees		Automatic Advance		R.P.M.	
Engine	Distributor	Distributor	Engine	Distributor	Engine
0	Start	400	800		
25.5	12.75	1600	3200		

Mounting:—Distributor mounted at left center of crankcase and driven by inclined shaft from camshaft. To remove, disconnect breaker lead, take off distributor cap, loosen clamp bolt in distributor arm, lift out.

Oiling:—5000 Miles. Turn down grease cup two or three turns. Keep cup filled with pressure lubricant. Take off distributor cap and rotor, put 2-4 drops S.A.E. #20 oil in oiler in center of shaft, apply thin film vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting—top dead center with manual control advanced.

To Set Ignition Timing:—Remove cover plate over inspection hole in top of flywheel housing, advance manual spark control (push button in toward dash), see that distributor is rotated clockwise to end of advance arm slot, latch out 'Spark Modifier' by inserting $\frac{1}{8}$ " pin through hole in advance arm and slot in secondary arm, turn engine over until No. 1 piston reaches top dead center on compression with flywheel mark 'U.D.C.1-6' opposite pointer on housing, loosen advance arm clamp bolt, rotate distributor cup until contacts begin to open (if ignition is turned on to check contact opening, use left hand position of switch to avoid automatic cranking), tighten clamp bolt, see that rotor is opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated.



STUDEBAKER

SIX MODEL 56 (1933) SERIAL NUMBERS 5,133,401 UP
DELCO-REMY SYSTEM

Firing Order:—1-4-2-6-3-5. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion #8. Set spark plug gaps at .025".

VALVE TIMING:—**Camshaft Setting.** Camshaft at right of engine is gear driven from crankshaft. Crankshaft gear (cast iron) has one marked tooth. Camshaft gear (Celoron-fabric) has two adjacent teeth marked. Mesh marked tooth of crankshaft gear between marked teeth of camshaft gear. Use a gear puller to remove and install gears.

To Check Valve Timing:—Set tappet clearance No. 1 intake valve at .010" (cold). With No. 6 piston on compression turn engine over until flywheel mark 'IN.OP./1-6' (which is 5° after top dead center mark 'U.D.C1-6') registers with pointer on flywheel housing. No. 1 intake valve should open at this point. Reset tappet clearance at .004" with engine warm.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 5/8" (overall)	11/32"	5 3/8"	45°	5/16"
Exhaust	1 1/2" "	11/32"	5 3/8"	45°	5/16"

Tappet Clearance

Operating Timing

Intake	.004" (hot) .010" (cold)	Closed	48-53 pounds (2 1/32")
Exhaust	.006" (hot) .010" (cold)	Open	71-76 pounds (1 23/32")

Spring Pressure

NOTE:—Install valves with stem clearance in guide of .001-.003" (intake and exhaust).

Intake Valves

Open 5° after top dead center.	Open 38° before lower dead center.
Close 53° after lower dead center.	Close 10° after top dead center.

Timing

Exhaust Valves

CARBURETION:—Stromberg Downdraft Carburetor, Model EX-22 (see Carburetor Section for complete data). Automatic manifold heat control and Stromberg Automatic choke standard equipment.

Air Cleaner:—Oil-wetted wire mesh type. Remove every month or six weeks, disassemble and remove cover and felt silencer pad, clean wire mesh unit by dipping in gasoline, dry, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—Stewart-Warner Mechanical Fuel Pump mounted on right side of crankcase (see Equipment Section for complete data). Remove sediment bowl on pump, clean filter screen (directly above bowl), empty water and sediment from bowl, at 3-month intervals.

Gasoline Gauge:—A.C. Electric type (see Equipment Section). Selector switch in gauge circuit permits gauge reading with ignition 'off' by pressing selector switch button.

STARTER:—Model 718-Z. Starter drive—Outboard Bendix drive and Startix switch. See Equipment Section for complete data on Startix and special Startix circuit breaker (Anti-backfire unit). Starter rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter cranks engine at 100 R.P.M. (1050 armature R.P.M.) drawing 180 amperes.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5.0	65
15 "	Lock	3.15	570

Mounting:—Three-capscrew flange mounting on front face of flywheel hous-

ing, left hand side. To remove, disconnect cable, take out flange mounting screws, pull starter forward to clear Bendix housing, lift out.

Oiling:—5000 Miles. Put 2-4 drops SAE. #20 engine oil in oiler on commutator end. Drive end bearing at outer end of Bendix housing is oilless.

GENERATOR:—Model 943-V. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate (standard setting), 12.5 amperes (hot) at 7.8 volts reached at 2200 R.P.M. or 20.4 M.P.H.

Charging Rate Adjustment. Take off commutator cover band, loosen small round headed lock screw on endplate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
16-18	8.2	1700	11-13	7.5-7.8	1750-1850

Brush Spring Tension:—14-18 ounces on each brush.

Field Current:—3.5-4.5 amperes at 6 volts across field terminals.

Motoring:—Approximately 5.5 amperes at 6 volts.

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, slip off drive belt, take out 2 bolts forming bracket hinge, lift out.

Belt Adjustment:—Loosen bracket hinge bolts and adjustment clamp bolt, pull generator away from engine until fan can just be rotated with belt held stationary, tighten adjustment bolt before slacking off on generator, tighten hinge bolts.

Oiling:—5000 Miles. Put 2-4 drops SAE. #20 engine oil in oiler at each end.

RELAY:—Model 265-G. Mounted on generator field frame. Contacts close at 7.3 M.P.H. or 780 R.P.M. with generator voltage of 6.4 volts and open with discharge current of 0-2.5 amperes.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Clum Switch, Model 9115. Lighting switch mounted at lower end of steering column controlled by lower lever on steering wheel. Lighting system 'depressed beam' with double filament headlight bulbs.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81

CURRENT LIMIT RELAY:—Model 410-L. Vibrating circuit breaker mounted on dash. Starts with current load of 25-30 amperes limiting load to 2-15 amperes with dead short-circuit across terminals.

Contact Gap:—.012-.030 inch. **Air Gap:**—.015-.025 inch (contacts closed).

Spring Tension:—5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

HORN:—Sparton vibrator type mounted under engine hood. Current draw—6 amperes at 6 volts.

STUDEBAKER

COMMANDER EIGHT, MODEL 73 (1933) SERIAL NUMBERS 8,040,001 UP
PRESIDENT EIGHT, MODEL 82 (1933) SERIAL NUMBERS 7,040,001 UP
DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On plate on frame side rail under left hand front fender.

ENGINE NUMBER:—Stamped on left center of engine block above water jacket cover.

ENGINE:—Eight cylinder, 'L' head type, Commander—3 1/16x4, President—3 1/16 x4 1/4 inches bore and stroke. Commander engine—235.7 cubic inch displacement, rated at 30 H.P., develops 100 H.P. at 3800 R.P.M. President engine—250.4 cubic inch displacement, rated at 30 H.P., develops 110 H.P. at 3600-3800 R.P.M. Standard compression ratio 5.5-1. Optional high compression head (6.0-1) available but not recommended by factory. Standard compression pressure 110 pounds at 1200 R.P.M.

BATTERY:—Commander—Willard, Type WH-1-13, 6 volt, 13 plate, 102 ampere hour (20 hour rate). Positive (+) terminal grounded to right hand frame rail. Starting capacity, 120 amperes for 20 minutes.

Mounting:—Battery mounted in cradle under driver's seat.

Dimensions:—Width, 7 1/16". Length, 9 1/16". Height, 9 5/16".

President—Willard, Type WH-4-17, 6 volt, 17 plate, 136 ampere hour capacity (20 hour rate). Positive (+) terminal grounded to frame.

Mounting:—Battery mounted under front floor boards on left hand side.

Dimensions:—Width, 7 1/16". Length, 11 11/16". Height, 9 5/16".

IGNITION:—Coil Model 537-X. Lock coil type mounted on back of instrument board.

Ignition Current:—1/2-1 1/2 amperes at 6 volts (engine running), 4-5 amperes at 6 volts (engine stopped).

Ignition Switch:—Switch has two 'On' positions. With key turned to right (regular running position) Startix is operative. With key turned to left (timing position) ignition is on but Startix is not connected.

Distributor:—Model 662-H. Two-breaker arm, four-lobe cam, semi-automatic advance type with manual retard and vacuum operated 'Spark Modifier'. Spark control button at left of instrument panel retards distributor 25° (engine) when pulled out for hand cranking or heavy pulling. Breaker contacts open alternately at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Timing).

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

Engine	Distributor	Distributor	Engine
Degrees	Automatic Advance	R.P.M.	
0	Start	300	600
29	14 1/2	1800	3600

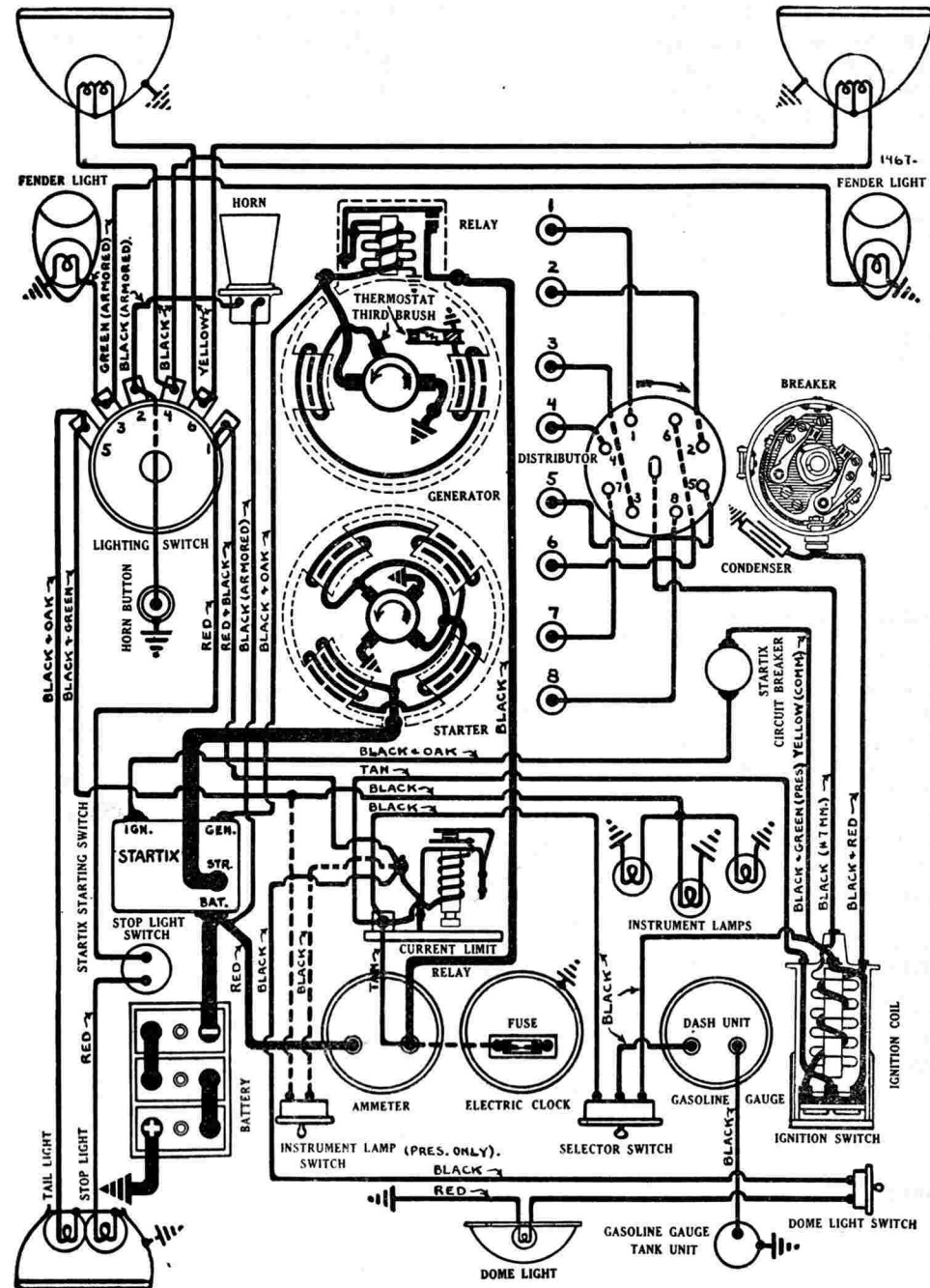
Spark Modifier Model 680-C:—Consists of spring-loaded vacuum operated diaphragm mounted on spark advance plate and connected to secondary plate directly underneath. Designed to momentarily retard spark (up to 6°) whenever engine is quickly accelerated to eliminate spark knock. It requires no attention.

Mounting:—Distributor mounted on cylinder head. Remove from right side of car. To remove, disconnect primary lead, take off distributor cap, loosen advance arm clamp bolt, lift out.

Oiling:—5000 Miles. Turn down grease cup two or three turns. Keep cup filled with pressure gun lubricant. Take off distributor cap and rotor, put 2-4 drops SAE #20 engine oil in oiler in center of shaft, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting—4° (flywheel) or .006"—Commander, .0066"—President (piston travel) before top dead center with manual control advanced.

To Set Ignition Timing:—Remove cover plate over inspection hole in fly-wheel housing, advance manual spark control (push button in toward dash),



STUDEBAKER

COMMANDER EIGHT, MODEL 73 (1933) SERIAL NUMBERS 8,040,001 UP

PRESIDENT EIGHT, MODEL 82 (1933) SERIAL NUMBERS 7,040,001 UP

DELCO-REMY SYSTEM

latch out 'Spark Modifier' by inserting $\frac{1}{8}$ " pin through hole in advance arm and slot in secondary arm, turn engine over until No. 1 piston on compression stroke reaches firing position with punch marks on flywheel (located 4° or approximately $\frac{1}{2}$ " before top dead center mark 'U.D.C.1-8') directly opposite pointer on flywheel housing. Loosen advance arm clamp bolt, rotate distributor cup until first set of contacts (mounted directly on breaker plate) begin to open (if ignition is turned on to check contact opening, use left hand position of switch to avoid automatic cranking). Tighten clamp bolt, see that rotor is opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated. Then synchronize contacts.

Synchronization of Contacts—First Method: Turn engine over 90° to firing position of No. 6 cylinder with punch marks on flywheel which are 4° or approximately $\frac{1}{2}$ " before top dead center mark 'U.D.C./3-6' directly opposite pointer on flywheel housing. Loosen lock screws on movable sub-plate (on which second set of contacts are mounted), turn eccentric adjusting screw until contacts begin to open, tighten lock screws.

Synchronization of Contacts—Second Method: Use special Delco-Remy tool, Part No. 1838182, and follow complete directions given in Equipment Section.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion #8. Set spark plug gaps at .025".

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is gear driven from crankshaft. Crankshaft gear (cast iron) has one marked tooth. Camshaft gear (Celeron-fabric) has two adjacent teeth marked. Mesh marked tooth of crankshaft gear between marked teeth on camshaft gear. Use a gear puller to remove and install gears.

To Check Valve Timing:—Set tappet clearance No. 1 intake valve at .010" cold. With No. 8 piston on compression stroke turn engine over until flywheel mark 'IN.OP./1-8' (which is 15° before top dead center mark 'U.D.C.1-8') is directly opposite pointer on housing. No. 1 intake valve should begin to open at this point. Reset tappet clearance at .004" with engine warm.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 13/32" (overall)	11/32"	5 7/32"	45°	11/32"
Exhaust	1 9/32" "	11/32"	5 7/32"	45°	11/32"

Tappet Clearance

	Operating Timing	Closed	Spring Pressure
Intake	.004" (hot) .010" (cold)	48-53 pounds—2 1/32"	
Exhaust	.006" (hot) .010" (cold)	71-76 pounds—1 23/32"	

NOTE:—Install intake valves on Commander Eight with .0012-.003" clearance in guide. Exhaust valves on Commander and all valves on President should have .001-.003" clearance in guides.

Intake Valves

Timing	Exhaust Valves
Open 15° before top dead center	Open 48° before lower dead center
Close 43° after lower dead center	Close 10° after top dead center

CARBURETION:—Stromberg Downdraft Carburetor, Model EE-22 (see Carburetor Section for complete data). Automatic manifold heat control and Stromberg Automatic Choke standard equipment.

Air Cleaner:—Oil-wetted wire mesh type. Remove every month or six weeks, clean wire mesh by dipping in gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—Stewart-Warner Mechanical Fuel Pump (Commander), A.C. Combination Fuel Pump and Vacuum Pump (President), mounted on right of crankcase (see Equipment Section for complete data). At 3-month intervals remove sediment bowl on pump, empty water and sediment, clean filter screen (directly above sediment bowl).

Gasoline Gauge:—A.C. Electric Type (see Equipment Section). Selector switch in gauge circuit permits gauge reading with ignition turned 'off' by press-

STARTER:—Model 718-Y. Starter drive—Outboard Bendix and Startix Switch.

See Equipment Section for complete data on Startix and special Startix circuit breaker (Anti-backfire unit). Starter rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces each. Starter cranks engine at 90 R.P.M. (1050 R.P.M. of armature), drawing 180 amperes.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5.0	65
2.2 "	1050		180
15 "	Lock	3.15	570

Mounting:—Three capscrew flange mounting on left hand side front face of flywheel housing. To remove, disconnect cable, take out flange mounting screws, pull starter forward to clear Bendix housing, lift out.

Oiling:—5000 Miles. Put 2-4 drops SAE #20 engine oil in oiler on commutator end. Drive end bearing at outer end of Bendix housing is oilless.

GENERATOR:—Model 955-C. Third brush regulation with thermostat control. Thermostat contacts open at 200°F . reducing output approximately 40%. Rotation counter-clockwise at commutator end. Maximum charging rate (standard setting) 11 amperes (hot) at 7.4 volts reached at 2100 R.P.M. or 24 M.P.H. (Commander), 22.8 M.P.H. (President).

Charging Rate Adjustment:—Take off commutator cover band, loosen small round lock screw on end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Cold Test		Generator Data		Hot Test	
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.3-8.5	1450	9-12	7.3-7.6	1800-2000

Brush Spring Tension:—14-18 ounces on each brush.

Field Current:—4.0-6.1 amperes at 6 volts across field terminals.

Motoring:—Approximately 5.5 amperes at 6 volts.

Mounting:—Cradle mounted at left front of engine with fan belt drive. Generator drives water pump through extension shaft and flexible coupling. To remove, disconnect lead, disconnect water pump drive coupling, slack off belt adjustment, loosen mounting clamp band, lift out.

Belt Adjustment:—Loosen nut back of fan bracket, lift up fan assembly until belt can just be turned with fan held stationary, tighten nut.

Oiling:—5000 Miles. Put 2-4 drops SAE #20 engine oil in oiler at each end.

RELAY:—Model 265-G. Mounted on generator field frame. Contacts close at 700 R.P.M. of generator or 7.9 M.P.H. (Commander), 7.6 M.P.H. (President) with generator voltage of 6.4 volts and open with 0-2.5 ampere discharge current.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Clum Switch, Model 9115. Lighting switch mounted at lower end of steering column controlled by lower lever on steering wheel. Lighting system 'depressed beam' with double filament headlight bulbs.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81

CURRENT LIMIT RELAY:—Model 410-L. Vibrating circuit breaker mounted on dash. Starts with current load of 25-30 amperes limiting load to 2-15 amperes.

Contact Gap:—.012-.030 inch. **Air Gap:**—.015-.025 inch (contacts closed).

Spring Tension:—5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

HORN:—Sparton Vibrator type mounted under engine hood. Current draw 6 amperes at 6 volts.

STUDEBAKER

SPEEDWAY PRESIDENT EIGHT, MODEL 92 (1933)

SERIAL NUMBERS 6,027,401 UP DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—On plate on frame side rail under left hand front fender. First serial number 6,027,401.

ENGINE NUMBER:—Stamped on top surface of fan bracket boss.

ENGINE:—Eight cylinder, 'L' head type, $3\frac{1}{2} \times 4\frac{3}{8}$ bore and stroke, 337 cubic inch displacement, NACC. rating 39.2 H.P., develops 132 H.P. at 3400-3600 R.P.M. Standard compression ratio, 5.5-1. Optional high compression head (6.0-1) available but not recommended by factory. Standard compression pressure, 120 pounds at 1200 R.P.M.

BATTERY:—Willard, Type WH-4-17, 6 volt, 17 plate, 136 ampere hour capacity (20 hour rate). Starting capacity, 160 amperes for 20 minutes.

Grounded Terminal:—Positive (+) terminal grounded to left hand frame side rail.

Mounting:—Battery mounted under front floor boards on left side.

Dimensions:—Width, 7 $\frac{1}{16}$ ". Length, 11 $\frac{11}{16}$ ". Height, 9 $\frac{5}{16}$ ".

IGNITION:—Coil Model 537-X. Lock coil type mounted on back of instrument board.

Ignition Current:— $\frac{1}{2}$ -1 $\frac{1}{2}$ amperes at 6 volts (engine idling), 4-5 amperes at 6 volts (engine stopped).

Ignition Switch:—Switch has two 'On' positions. With key turned to right (regular running position), Startix is operative. With key turned to left (timing position), ignition is on but Startix is not connected.

Distributor Model 662-G. Two breaker arm, 4 lobe cam, semi-automatic advance type with manual retard and vacuum operated 'Spark Modifier.' Spark control button at left of instrument panel retards distributor 25° (engine) when pulled out for hand cranking or heavy pulling. Breaker contacts open alternately at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Timing).

Spark Modifier Model 680-C. Consists of spring loaded vacuum operated diaphragm mounted on spark advance plate and connected to secondary plate directly underneath. Designed to momentarily retard spark (up to 6°) whenever engine is quickly accelerated to eliminate spark knock. It requires no attention.

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

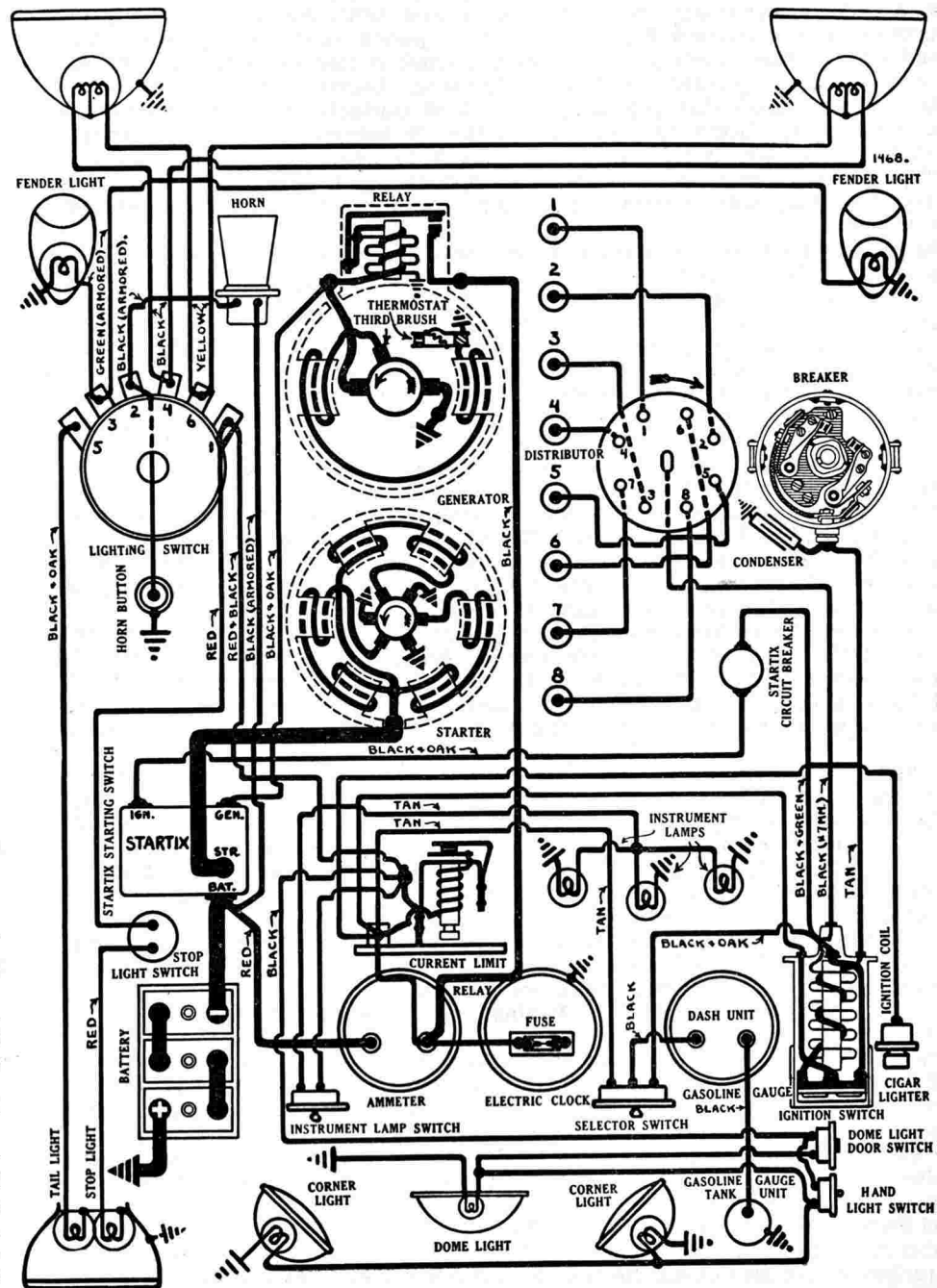
Engine	Degrees	Distributor	Distributor	Engine
1.0	Start	300	600	
25	12 $\frac{1}{2}$	1800	3600	

Mounting:—Distributor mounted on cylinder head. Remove from right side of car. To remove, disconnect primary lead, take off distributor cap, loosen advance arm clamp bolt, lift distributor out.

Oiling:—5000 Miles. Turn down grease cup 2-3 turns. Keep cup filled with pressure gun lubricant. Take off distributor cap and rotor, put 2-4 drops S.A.E. #20 engine oil in oiler in center of shaft, apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard Setting. Top dead center with manual control advanced.

To Set Ignition Timing:—Remove cover plate over inspection hole in fly-wheel housing, advance manual spark control (push button in toward dash), latch out 'Spark Modifier' by inserting $\frac{1}{8}$ " pin through hole in advance arm and slot in secondary arm, turn engine over until piston No. 1 on compression reaches top dead center with flywheel mark 'U.D.C./1-8' directly opposite pointer on housing. Loosen advance arm clamp bolt, rotate distributor cup until first set of contacts (mounted directly on breaker plate) begin to open (if ignition is turned on to check contact opening, use left hand position of switch to avoid automatic cranking), tighten clamp



STUDEBAKER

SPEEDWAY PRESIDENT EIGHT, MODEL 92 (1933)

SERIAL NUMBERS 6,027,401 UP

DELCO-REMY SYSTEM

bolt, see that rotor is opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated. Then synchronize contacts.

Synchronization of Contacts—First Method:—Turn engine over 90° to firing position for No. 6 cylinder with flywheel mark 'U.D.C./3-6' directly opposite pointer on flywheel housing, loosen lock screws on movable sub-plate (carrying second set of breaker contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws.

Synchronization of Contacts—Second Method:—Use special Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion No. 8. Set gaps at .025 inch.

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine is gear driven from crankshaft. Crankshaft gear (castiron) has one marked tooth. Camshaft gear (Celeron-fabric) has two adjacent teeth marked. Mesh marked tooth of crankshaft gear between marked teeth on camshaft gear. Use a gear puller to remove and install gears.

To Check Valve Timing:—Set tappet clearance No. 1 intake valve at .010" cold. With No. 8 piston on compression turn engine over until flywheel mark 'IN.OP./1-8' (which is 5° past top dead center mark 'U.D.C./1-8') is directly opposite pointer on housing. No. 1 intake valve should begin to open at this point. Reset tappet clearance at .004" with engine warm.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 21/32" (overall)	3/8"	5 19/32"	45°	11/32"
Exhaust	1 9/16"	3/8"	5 19/32"	45°	11/32"

Tappet Clearance

Operating Timing

Intake	.004" (hot) .010" (cold)	Closed	59-64 pounds—2 3/32"
Exhaust	.006" (hot) .010" (cold)	Open	98-108 pounds—1 3/4"

NOTE:—Install all valves with .001-.003" steam clearance in guides.

Intake Valves

Timing

Exhaust Valves

Open 5° after top dead center. Open 40° before lower dead center.
Close 45° after lower dead center. Close 12° after top dead center.

CARBURETION:—Stromberg Downdraft Carburetor, Model EE-22 (see Carburetor Section for complete data). Automatic manifold heat control and Stromberg Automatic Choke standard equipment.

Air Cleaner:—Oil-wetted wire mesh type. Remove every month or six weeks, clean wire mesh by dipping in gasoline, thoroughly dry, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Combination fuel and vacuum pump (see Equipment Section for complete data). At 3 month intervals, remove sediment bowl on pump, clean filter screen (mounted directly above bowl), empty water and sediment from bowl before replacing.

Gasoline Gauge:—A.C. Electric Type (see Equipment Section). Selector switch in gauge circuit permits gauge readings with ignition turned 'off' by pressing selector switch button.

STARTER:—Model 497. Six pole type. Starter drive—Outboard Bendix drive and Startix switch. See Equipment Section for complete data on Startix and Special Startix circuit breaker (Anti-backfire unit). Rotation counter-clockwise at commutator end. Brush spring tension 36-40 ounces each. Starter cranks engine at 90 R.P.M. (1050 armature R.P.M.) drawing 180 amperes.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	5.0	70
3.6 "	1050		180
19 "	Lock	3.0	500

Mounting:—Three capscrew flange mounting on left hand side of front face of flywheel housing. To remove, disconnect cable, take out flange mounting screws, pull starter straight forward to clear Bendix housing, lift out.

Oiling:—Starter bearings are oilless.

GENERATOR:—Model 927-J. Third brush regulation with thermostat control. Thermostat contacts open at 160-170°F. reducing charging rate approximately 40%. Rotation counter-clockwise at commutator end. Maximum charging rate (standard setting), 11 amperes (hot) at 7.7 volts reached at 1800 R.P.M. or 23.4 M.P.H.

Charging Rate Adjustment:—Take off commutator cover band, loosen small round lock screw on end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
20-22	8.5-8.7	1600	12-14	7.6-7.9	1800

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—1.8-2.3 amperes at 6 volts across field terminals.

Motoring:—3.5 amperes at 6 volts approximately.

Mounting:—Cradle mounted at left front of engine with fan belt drive. Generator drives water pump through extension shaft and flexible coupling. To remove, disconnect lead, disconnect water pump drive coupling, slack off drive belt, loosen mounting clamp band, lift generator out.

Belt Adjustment. Loosen nut on back of fan bracket, lift up fan assembly until belt can just be turned with fan held stationary, tighten nut.

Oiling:—5000 Miles. Put 2-4 drops S.A.E. #20 engine oil in oiler at each end.
RELAY:—Model 265-B. Mounted on generator field frame. Contacts close at 650 R.P.M. of generator or 8.6 M.P.H. with generator voltage of 6.4 volts and open with discharge current of 0-2.5 amperes.

Contact Gap:—.015-.025 inch. **Air Gap:**—.012-.017 inch (contacts closed).

LIGHTING:—Clum Switch, Model 9115. Lighting switch mounted at lower end of steering column and controlled by lower lever on steering wheel. Lighting system 'depressed beam' with double filament headlight bulbs.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Instrument and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome and Corner Lights	6-8	6	S.C.	81

CURRENT LIMIT RELAY:—Model 410-L. Vibrating circuit breaker mounted on the dash. Starts with current load of 25-30 amperes limiting load to 2-15 amperes.

Contact Gap:—.012-.030 inch. **Air Gap:**—.015-.025 inch (contacts closed).

Spring Tension:—5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

HORN:—Sparton vibrator type mounted under engine hood. Current draw, 6 amperes at 6 volts.

FUSES:—5 ampere capacity mounted on back of electric clock.

STUTZ

MODEL SV-16 (1933)

DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—Stamped on plate on right front side of engine dash and on right top side of front frame cross member (forward engine support).

ENGINE NUMBER:—Stamped on plate on right side cylinder cover and on right crankcase wall back of distributor.

ENGINE:—Eight cylinder, 'I' or overhead valve type, $3\frac{3}{8} \times 4\frac{1}{2}$ " bore and stroke, 322 cubic inch displacement, rated at 46.4 H.P., develops 113 H.P. at 3300 R.P.M. Standard compression ratio 5.5-1. Optional low compression ratio 5.0-1.

BATTERY:—Prest-O-Lite, Type A-619-ST, 6 volt, 19 plate, 145 ampere hour capacity (5 ampere rate). Starting capacity 173 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—On left hand side of frame under driver's seat.

Dimensions:—Width, 7". Length, 13". Height, 9 $\frac{3}{16}$ ".

IGNITION:—Coil Model 531-C (2 used). Coils are mounted at right of engine.

Ignition Current:—6 amperes at 6 volts (engine running), 10 amperes at 6 volts (engine stopped) total for both coils.

Ignition Switch:—Oakes 'Hershey' type co-incidental ignition switch and steering post lock.

Distributor Model 4028. Two breaker arm, 8-lobe cam type with semi-automatic advance. Breaker contacts open simultaneously to fire both spark plugs in each cylinder. Contacts must be synchronized—(see Timing). Manual advance is controlled by left hand lever on steering wheel. Maximum manual advance is 38° (engine).

Breaker Gap:—Set contact gap at .017". Hold within limits of .015-.020".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Engine	Degrees	Automatic Advance	R.P.M.	Engine
0	Start	Distributor	300	600
22	11	1400		2800

Mounting:—Distributor mounted on accessory bracket at right front of engine. To remove, disconnect manual spark control, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

Oiling:—750 Miles. Put 8-10 drops light engine oil in oiler on side of distributor cup.

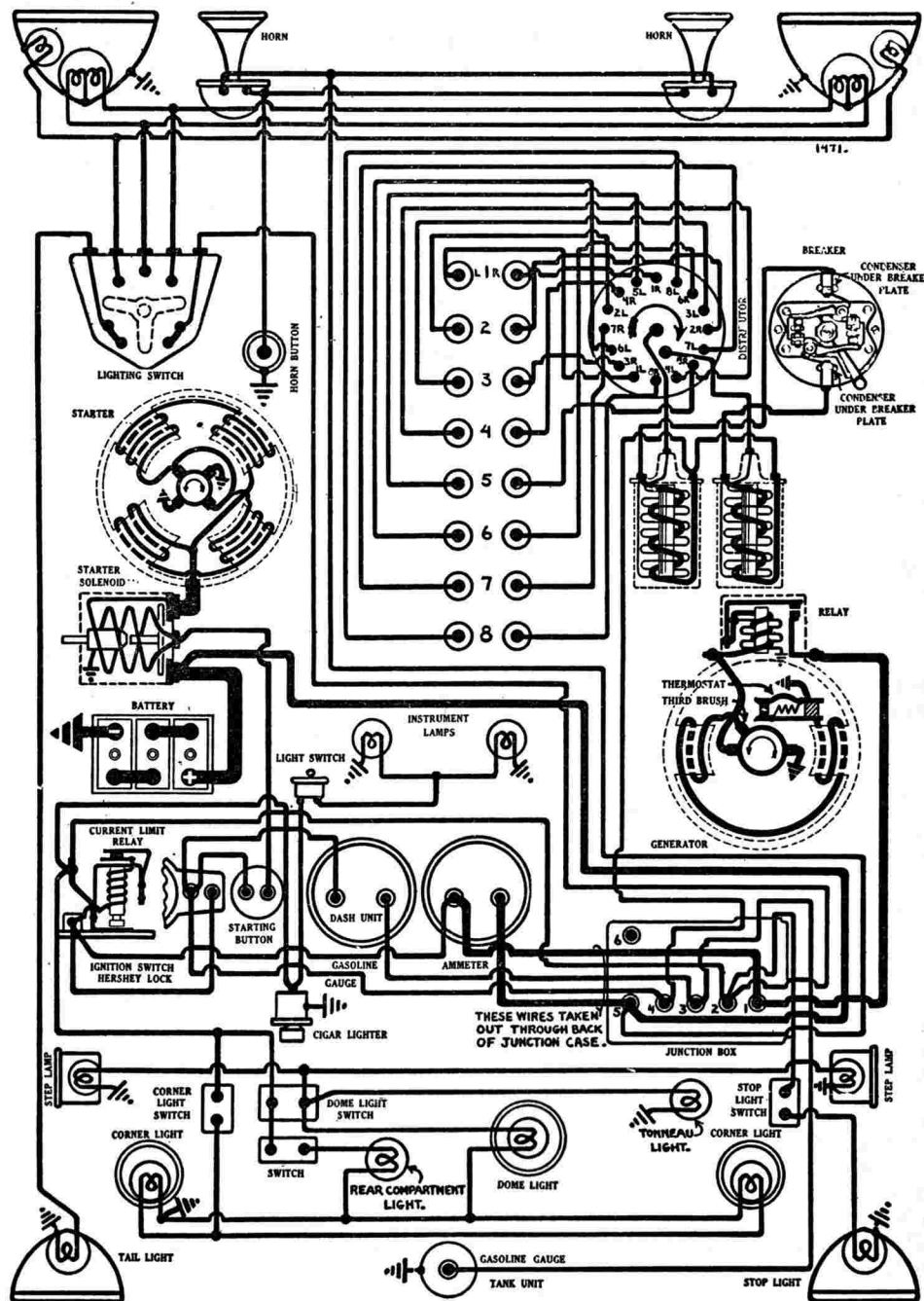
1000 Miles. Take off distributor cap and rotor. Put one drop oil on breaker arm pivot pins, apply thin film vaseline to face of breaker cam.

Timing:—Standard setting 15° (on flywheel) before top dead center with manual spark control fully advanced. To set timing, first advance manual spark control (pull lever down), see that distributor is rotated counter-clockwise to end of advance arm slot, take off cover over inspection hole in top of flywheel housing. With No. 1 piston on compression turn engine over until piston is slightly before top dead center with flywheel mark AD.SP.K. 1 & 8' directly opposite indicator on housing, loosen taper lock screw in center of breaker cam, carefully locate cam so that contacts are beginning to open (use test lamp), tighten locking screw, connect spark plugs as indicated on diagram.

Synchronization of Contacts. To synchronize contacts, connect test lamp in each primary circuit, loosen four lock screws on movable breaker sub-plate, shift plate until both sets of contacts open at the same instant. Synchronization should be checked whenever contacts are adjusted or ignition is set.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator. See diagram for order in which spark plug cables are connected around distributor head.

Spark Plugs:—18 MM. Metric. Champion No. 7. Set gaps at .022 inch.



STUTZ

MODEL SV-16 (1933)

DELCO-REMY SYSTEM

VALVE TIMING:—Valves in cylinder head operated directly from overhead camshaft. Camshaft driven from transfer sprocket on front of engine by silent timing chain. Transfer sprocket driven from crankshaft in tandem with accessory sprocket by silent timing chain. Automatic idler sprockets on both chains.

Valve Specifications

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake and Exhaust	1 21/32"	3/8"	6 11/32"	45°	11/32"

Tappet Clearance

		Spring Pressure
Intake	.028" (see note)	Closed 56 pounds (2 27/64")
Exhaust	.028" (see note)	Open 102 pounds (2 5/64")

Intake Valves

	Timing	Exhaust Valves
Open—1° before top dead center.	Open—49° before lower dead center.	
Close—55° after lower dead center.	Close—7° after top dead center.	

Note on Tappet Clearance or Lash:—Valves equipped with conventional removable valve stem guide (inner guide) and piston guide (outer guide) screwed on end of valve stem. Valve caps (which bears against cam face) are screwed on valve stem against valve piston. To set tappet clearance or lash, turn camshaft until nose of cam points up at 45° angle with heel of cam at one side of metering pin directly over valve cap. Insert bar in hole of valve piston (piston guide cut away on left side), hold valve piston from turning, turn valve cap with bar inserted in hole to loosen. Adjust lash to .028" by screwing valve cap and piston up or down on valve stem.

To Check Valve Timing. Set tappet clearance or lash of No. 1 exhaust valve at .028" (see above). With No. 8 piston on compression turn engine over until No. 1 exhaust valve begins to close (insert valve adjusting rod in hole in valve cap and oscillate valve until added drag indicates that valve has begun to seat). Flywheel mark 'EX.CL.1 & 8' should be directly opposite indicator on housing (inspection hole at top or side of flywheel housing).

To Set Valve Timing—with upper chain and idler sprocket off engine and camshaft sprocket off camshaft. Turn crankshaft until flywheel mark 'EX.CL.1 & 8' is directly opposite indicator on housing. Turn camshaft in direction of rotation until No. 1 exhaust valve has begun to close (see paragraph above). Mesh camshaft sprocket in chain, turn sprocket counter-clockwise to take up all slack in driving side of chain, slip chain on transfer sprocket one tooth at a time until cap screws can be inserted without disturbing position of camshaft (a closer adjustment can be obtained by rotating camshaft sprocket one quarter turn which changes the timing 1/4 tooth). After mounting camshaft sprocket, mesh automatic sprocket, turn eccentric hub clockwise to take up all slack in chain, wind up spring 1 1/2 turns to secure proper spring tension, insert end of spring in nearest slot in stud, assemble plain washer and cotter pin. Wire camshaft sprocket cap screws. Check setting and set tappet clearance or lash of all valves at .028 inch.

CARBURETION:—Zenith Updraft Dual Carburetor (see Carburetor Section for complete data).

Fuel System:—Kingston Vacuum tank mounted on dash.

Gasoline Gauge:—Stewart-Warner electric type.

STARTER:—Model 727-C. Starter drive—Mechanical pinion shift operated by solenoid mounted on starter field frame. Solenoid is controlled by push-button starting switch mounted on instrument panel. See section on 'Starter Controls in Equipment Section for complete data. Starter rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5500	5.0	65
16 "	Lock	3.0	600

Mounting:—Starter flange mounted left front face flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage, take out 3 flange mounting screws, pull starter forward to clear pinion housing, lift out.

Oiling:—750 Miles. Put 8-10 drops light engine oil in commutator end oiler. Intermediate bearing and drive end bearing are graphite bronze oilless.

GENERATOR:—Model 391. Third brush regulation, thermostat control. Thermostat operates at 160°F. (contacts open, cuts in resistance) reducing output approximately 40%. Rotation is counter-clockwise at commutator end. Maximum charging rate is 12 amperes (hot) at 7.3 volts reached at 1600 R.P.M. or 32 M.P.H.

Charging Rate Adjustment. Take off commutator cover band, shift third brush by prying on brush mounting plate by means of a screwdriver inserted in the slot in the plate. Shift third brush counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction.

Generator Data

Cold Test		Hot Test	
Amperes	Volts	Amperes	Volts
22-24	8.2-8.6	10-12	7.3-7.6
	1400		1600

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—1.8-2.3 amperes at 6 volts across field terminals.

Mounting:—Generator flange mounted on rear face of accessory bracket at right of engine. To remove, disconnect water pump drive coupling, disconnect lead, take out 3 flange mounting screws, pull generator to rear to disengage drive coupling, lift out.

Oiling:—750 Miles. Put 8-10 drops light engine oil in oiler at each end.

RELAY:—Model 266-N. Relay mounted on generator. Contacts close at 600 R.P.M. of generator or 7 M.P.H. with generator voltage of 7-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

LIGHTING:—Delco-Remy Switch, Model 486-G. Lighting switch mounted at lower end of steering column controlled by lower lever on steering wheel. Headlights are fitted with double filament bulbs for 'depressed beam' dimming and are controlled by the lighting switch.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
mostat operates at 160°F. (contacts open, cuts in resistance) reducing				
Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Parking Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome and Corner Lights	6-8	15	S.C.	87

CURRENT LIMIT RELAY:—Model 410-C. Vibrating circuit breaker mounted on back of instrument panel at extreme left. Circuit breaker begins to vibrate with current load of 25-30 amperes limiting load to 2-15 amperes with direct short-circuit.

Contact Gap:—.012-.030". **Air Gap:**—.015-.025" with contacts closed.

Spring Tension:—5 ounces minimum measured at brass button with spring scale at right angles to contact arm.

HORNS:—Klaxon Model K-26, Type 1509 (low note), Type 1510 (high note) matched tone twin horns. Current draw 6.0-8.5 amperes at 6.0 volts (Type 1509), 5.0-6.5 amperes at 6.0 volts (Type 1510).

STUTZ

MODEL DV-32 (1933)

DELCO-REMY SYSTEM

CAR SERIAL NUMBER:—Stamped on plate on right front side of engine dash and on right top side of frame front cross member (front engine support).

ENGINE NUMBER:—Stamped on plate on right side cylinder head cover and on right crankcase wall back of distributor.

ENGINE:—Eight cylinder, 'I' or overhead valve type with separate intake and exhaust camshafts mounted on cylinder head and two intake and exhaust valves per cylinder. Bore and stroke $3\frac{3}{8} \times 4\frac{1}{2}$ ", 322 cubic inch displacement, rated at 46.4 H.P., develops 156 H.P. at 3900 R.P.M. Standard compression ratio 5.0-1. Optional high compression ratio 5.5-1.

BATTERY:—Prest-O-Lite, Type A-619-ST, 6 volt, 19 plate, 145 ampere hour capacity (5 ampere rate). Starting capacity 173 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded.

Mounting:—On left hand side of frame under driver's seat.

Dimensions:—Width, 7". Length, 13". Height, 9 $\frac{3}{16}$ ".

IGNITION:—Coil Model 531-C. Coil mounted on bracket at right front of engine beside generator. Ignition current 3 amperes at 6 volts (engine running) 5 amperes at 6 volts (engine stopped). Ignition switch is Oakes 'Hershey' type co-incidental ignition switch and steering post lock.

Distributor Model 660-W. Two breaker arm, 4 lobe cam type with semi-automatic advance. Breaker contacts open alternately at 45° intervals corresponding to 90-degree firing interval of engine. Contacts must be synchronized (see Timing).

Manual Advance:—40 degrees (engine) maximum.

Breaker Gap:—Set contact gap at .020". Hold within limits of .018-.024".

Breaker Arm Spring Tension:—17-21 ounces measured at tip of breaker arm with spring scale at right angles to contact surface.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start	300	600		
37	18½	2100	4200		

Mounting:—Distributor mounted on accessory bracket at right front of engine. To remove, disconnect lead, disconnect manual spark control, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

Oiling:—750 Miles. Turn down grease cup on side of shaft housing one full turn. Keep cup filled with medium cup grease.

1000 Miles:—Take off distributor cap and rotor. Oil wick oiler in center of shaft with light engine oil, apply thin film vaseline to face of breaker cam.

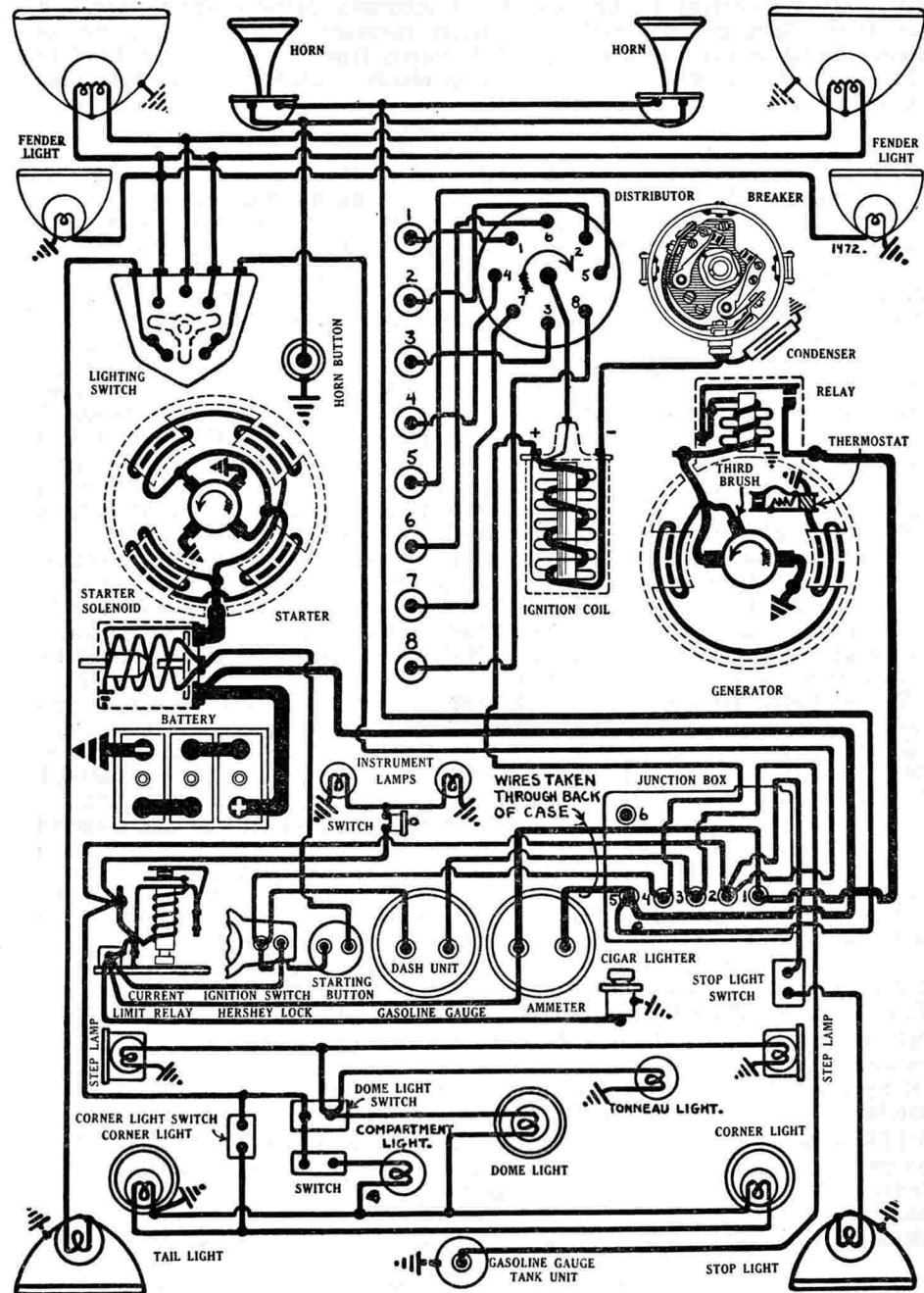
Timing:—Standard setting 20° (on flywheel) before top dead center with manual spark control fully advanced. To set timing, first advance manual spark control (pull lever down), see that distributor is rotated counter-clockwise to end of advance arm slot, take off cover plate over inspection hole in top of flywheel housing. With No. 1 piston on compression stroke, turn engine over until flywheel mark 'AD.SP.K.1&8' (which is 20° before top dead center mark 'TOP C.1 & 8') is directly opposite indicator in inspection hole, loosen advance arm clampscrew, rotate distributor until first set of contacts mounted directly on breaker plate begin to open (use test lamp), tighten clamp screw, connect spark plugs as indicated on diagram.

Synchronization of Contacts. Use special Delco-Remy tool, Part No. 1838182 and follow complete directions in Equipment Section. No flywheel marks provided to check synchronization by timing distributor using second set of contacts.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion No. 7. Set gaps at .022 inch.

VALVE TIMING:—Exhaust valves (two per cylinder) in cylinder head at right of engine operated by overhead exhaust camshaft. Intake valves (two per cylinder) in cylinder head at left of engine operated by overhead intake camshaft. Both camshafts driven in tandem by silent timing chain from transfer sprocket on front of engine block. Transfer sprocket driven in tandem with accessory sprocket by silent timing chain from crankshaft. Both chains equipped with automatic take-up idler sprockets, no adjustment necessary in service.



STUTZ

MODEL DV-32 (1933)

DELCO-REMY SYSTEM

Valve Specifications

Valve	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
(Straight Stem)					
Intake and Exhaust 1 9/32"	3/8"	5 21/32"	45°	11/32"	

Tappet Clearance

Intake .028" or .046" see note	Open .115 pounds (1 15/16")
Exhaust .028" or .046" see note	Closed .53 pounds (2 9/32")

Valve Springs

Intake Valves	Timing	Exhaust Valves
Open—5° before top dead center.	Open—46° before lower dead center.	
Close—41° after lower dead center.	Close—10° after top dead center.	

Note on Tappet Clearance or Lash:—Tappet clearance on various engines set at either .028" or .046". Correct tappet clearance for each engine is stamped on name plate on engine and should be consulted when tappet clearance is being set. Valves are fitted with conventional removable valve stem guide (inner guide) and piston guide screwed on end of valve stem (outer guide). Valve cap (which bears on cam face) is screwed on valve stem against valve piston. To set tappet clearance or lash, turn camshaft until nose of cam is perpendicular (at right angles to face of valve cap), with metering pin turned off valve cap. Insert adjusting bar in hole in valve piston (piston guide cut away on inside), hold valve piston from turning, insert second bar in hole in valve cap and turn cap to loosen. Adjust lash to .028" or .046" by screwing valve cap and piston up or down on valve stem. All turning must be done on valve cap to avoid formation of burs on valve piston.

To Check Valve Timing Intake Camshaft:—Set tappet clearance No. 1 intake and exhaust valves at .028" or .046" (see name plate on engine), take off cover plate over inspection hole in top or side of flywheel housing. Turn engine over until No. 1 intake cam is about to touch valve cap (tappet clearance taken up—valve about to open), insert adjusting bar in valve cap hole so that bar is pointed across engine and loop rubber band over bar fastening other end of band to engine so that band tension is slightly less than amount necessary to rotate valve. Turn engine over slightly until band begins to rotate valve indicating that valve has left its seat. Flywheel mark 'IN.OP.1 & 8' (which is 5° before top dead center mark "TOP. C. 1 & 8") should be directly opposite indicator on housing. If setting is not exact, turn crankshaft over two revolutions and stop with flywheel mark at indicator. Then loosen camshaft sprocket mounting cap-screws slightly, rotate camshaft until intake valve begins to open, tighten cap-screws (capscrew holes are slotted). Check setting.

To Check Exhaust Camshaft:—After checking intake camshaft setting (above) insert adjusting rod in hole of No. 1 exhaust valve cap, turn engine over slowly until added drag on rod when valve is oscillated indicates that valve is beginning to seat. Flywheel mark 'EX.CL.1 & 8' (which is 10° after top dead center mark "TOP.C. 1 & 8") should be directly opposite indicator on housing. If setting is not correct, turn crankshaft two revolutions and stop with flywheel mark at indicator. Then loosen camshaft sprocket mounting cap-screws slightly, turn camshaft until valve closes, tighten mounting screws (capscrew holes are slotted). Check setting.

To Set Valve Timing:—With intake and exhaust camshaft sprockets and automatic idler take-up sprocket off engine. Turn crankshaft until flywheel mark '0' (which is 2 1/2° after top dead center mark "TOP.C.1 8") is directly opposite indicator on housing with distributor rotor pointed toward rear of car (if rotor points toward front of car turn engine over one complete revolution). Turn intake camshaft until No. 1 intake valve is about to open and turn exhaust camshaft until No. 1 exhaust valve is about to close. Mesh intake camshaft sprocket in chain, turn sprocket counter-clockwise to take up all slack in driving side of chain (between sprocket and transfer sprocket), see if lines indicating center of slotted holes in sprocket line up with lines on camshaft flange indicating center of cap-screw holes without disturbing position of camshaft. If they do not, slip sprocket on chain one tooth at a time to left until sprocket can be mounted on flange with marks in line without disturbing camshaft. This is necessary to provide for later adjustment. Insert cap-screws mounting sprocket on flange. Mesh exhaust camshaft sprocket in chain, turn to left to take up slack in driving side of chain between camshaft sprockets, slip sprocket on chain one tooth at a time until sprocket can be mounted on camshaft flange with marks indicating center of slots in sprocket and center of holes in flange in line without disturbing position of camshaft.

to take up all slack in chain, wind up eccentric spring one and one half turns, insert end of spring in nearest slot, assemble washer and cotter. Check valve timing as directed above for both camshafts and make any adjustment necessary by shifting sprockets on camshafts until exact settings are secured.

CARBURETION:—Stromberg Downdraft Carburetor, Model EE-3 (see Carburetor Section for complete data). Stromberg Automatic Choke is standard equipment.

Fuel Pump:—Stewart-Warner mechanical type fuel pump is mounted on valve cover at left rear of engine (see Equipment Section for data).

Gasoline Gauge:—Stewart-Warner electric type.

STARTER:—Model 727-C. Starter drive—mechanical pinion shift operated by solenoid mounted on starter field frame. Solenoid is controlled by push-button starting switch on instrument board. See 'Starter Controls' in Equipment Section for complete data on this equipment. Starter rotation is counter-clockwise at commutator end. Brush spring tension is 24-28 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5500	5.0	65
15 "	Lock	3.0	600

Mounting:—Starter flange mounted left front face flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage, take out 3 flange mounting screws, pull starter forward to clear pinion housing, lift out.

Oiling:—750 Miles. Put 8-10 drops light engine oil in commutator end oiler. Intermediate bearing and drive end bearing are graphite bronze oilless.

GENERATOR:—Model 391. Third brush regulation, thermostat control. Thermostat operates at 160° F. (contacts open, cuts in resistance) reducing output approximately 40%. Rotation is counter-clockwise at commutator end. Maximum charging rate is 12 amperes at 7.3 volts (hot) reached at 1600 R.P.M. or 32 M.P.H.

Charging Rate Adjustment. Take off commutator cover band, shift third brush by means of a screwdriver inserted in slot in brush mounting plate, counter-clockwise to increase, or clockwise to decrease charging rate. Brush mounting plate is held in position by friction.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
22-24	8.2-8.6	1400	10-12	7.3-7.6	1600

Brush Spring Tension:—20-28 ounces on each brush.

Field Current:—1.8-2.3 amperes at 6 volts across field terminals.

Mounting:—Generator flange mounted on rear face of accessory bracket at right of engine. To remove, disconnect water pump drive coupling, disconnect lead, take out 3 flange screws, pull generator to rear to disengage drive coupling, lift out.

Oiling:—750 Miles. Put 8-10 drops light engine oil in oiler at each end.

RELAY:—Model 266-N. Relay mounted on generator. Contacts close at 600 R.P.M. of generator, or 7 M.P.H. with generator voltage of 7-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact gap limits .012-.017 inch (contacts closed).

LIGHTING:—Delco-Remy Switch, Model 486-G. Lighting switch mounted at the lower end of steering column controlled by lower lever on steering wheel. Headlights fitted with double filament bulbs for 'depressed beam' dimming.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Parking Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Lights	6-8	15	S.C.	87
Dome, Corner Lights	6-8	15	S.C.	87

CURRENT LIMIT RELAY:—Model 410-C. Vibrating circuit breaker mounted on back of instrument panel at extreme left. Circuit breaker begins to vibrate with current load of 25-30 amperes, limiting load to 2-15 amperes with direct short-circuit.

Contact Gap:—.012-.030". **Air Gap:**—.015-.025" with contacts closed.

Spring Tension:—5 ounces minimum measured at brass button with spring scale at right angles to contact arm.

HORNS:—Klaxon Model K-26, Type 1509 (low note), Type 1510 (high note), matched tone twin horns. Current draw 6.0-8.5 amperes at 6.0 volts (Type

WILLYS OVERLAND SIX

STREAM LINE MODEL 6-90A—AFTER JUNE, 1932

AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—Stamped on plate on left hand frame side rail in front of left front spring rear shackle and on plate under driver's seat cushion. First serial number of this model—14201.

ENGINE NUMBER:—Stamped on left hand upper front of engine block.

ENGINE:—Six cylinder, 'L' head type, $3\frac{1}{4} \times 3\frac{3}{8}$ " bore and stroke, 193 cubic inch displacement, rated at 25.35 H.P., develops 65 H.P. at 3400 R.P.M. Standard compression ratio—5.26-1.

BATTERY:—U.S.L., Type XY-13X-7A, 6 volt, 13 plate, 87.5 ampere hour capacity (5 ampere rate). Starting capacity 102 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—On left hand frame side rail under front floor boards.

Dimensions:—Width, $7\frac{1}{4}$ ". Length, 9". Height, $8\frac{5}{8}$ ".

IGNITION:—Coil Model IG-4602 (Closed cars), IG-4502 (Sport Roadster), IG-4501 (Std. Roadster). Coil Type IG-4501, 4502 lock coil type mounted on back of instrument board with switch in base. Coil Type IG-4602 mounted on dash and connected to special Electrolock by means of armored cable (see Equipment Section).

Ignition Current:— $1\frac{1}{2}$ amperes at 6 volts (engine running), 3.4-5 amperes at 6 volts (engine stopped).

Distributor Model IGB-4032. Single breaker arm, 6 lobe cam, semi-automatic advance type. Manual advance controlled by button on dash. Distributor is retarded by pulling out button for hand cranking or heavy pulling. Pushing button in toward dash advances distributor 20° (engine).

Breaker Gap:—Set contact at .018". Hold within limits of .018-.020".

Breaker Arm Spring Tension:—16-22 ounces (measured at tip of breaker arm with spring scale centered on arm and at right angles to breaker arm).

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start	200	400		
6	3	600	1200		
12	6	1000	2000		
16	8	1240	2480		
20	10	1500	3000		

Mounting:—Distributor mounted at left center of engine and driven by an inclined shaft from the camshaft. To remove, disconnect primary lead, disconnect manual spark control, take off distributor cap, take out hold-down screw in advance arm, lift out.

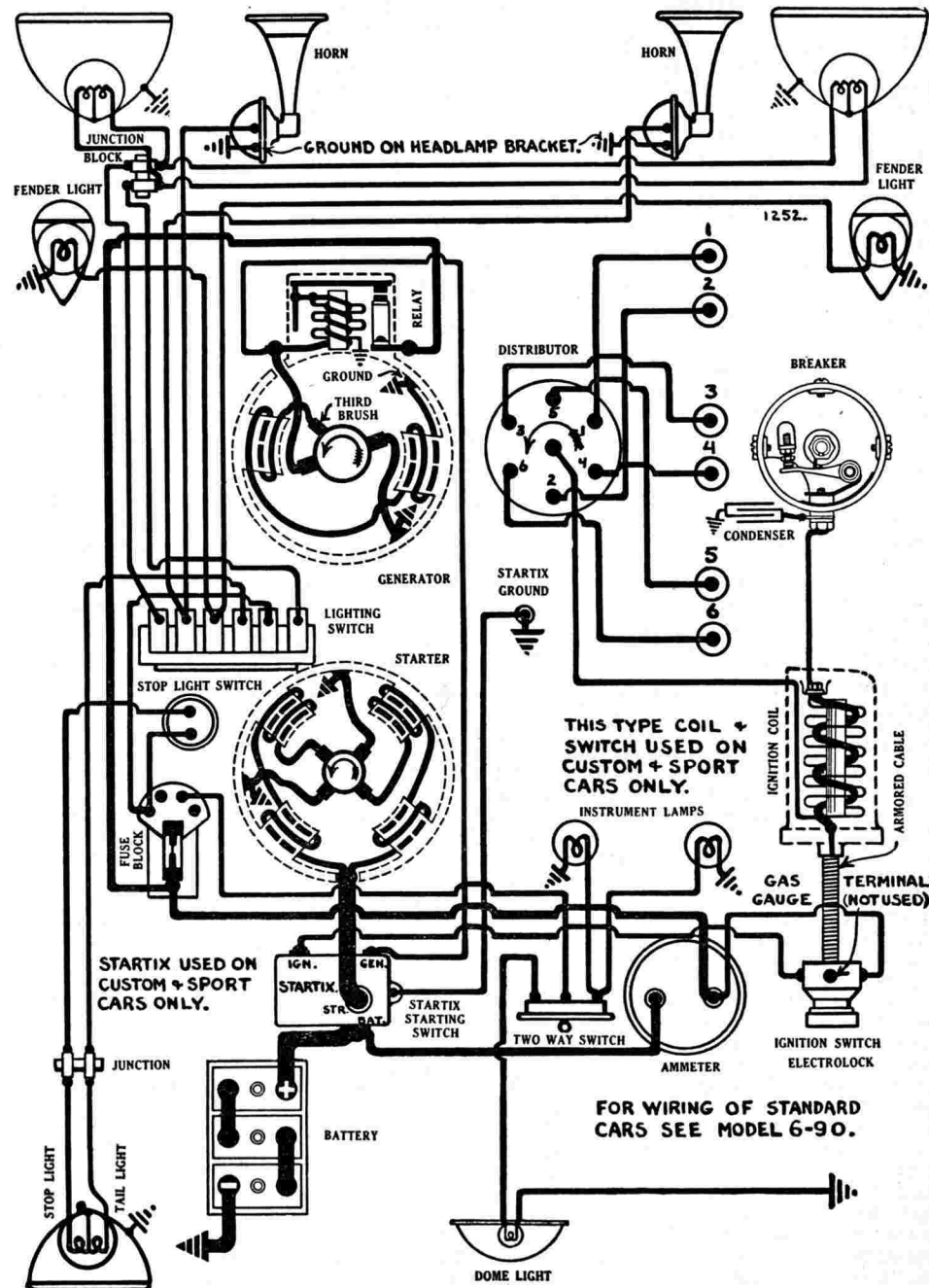
Oiling:—250 Miles. Put 6 drops SAE. #20 engine oil in oiler on side of shaft. Take off distributor cap and rotor, put 6 drops oil in wick oiler in center of shaft.

5000 Miles. Apply thin film vaseline to face of breaker cam.

IGNITION TIMING:—Standard Setting—top dead center with manual control advanced.

To Set Ignition Timing:—Take off cover plate over inspection hole in left hand front face of flywheel housing, advance manual spark control (push button in toward dash), see that distributor is rotated clockwise to end of advance arm slot. With No. 1 piston on compression turn engine over until piston reaches top dead center with flywheel mark '1-6 CYL./IGN.TC' directly opposite indicator on housing, loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated.

Note on Cars with Startix:—The Electrolock ignition switch used on all cars with Startix automatic starting switch has two 'On' positions. The first 'On' position (approximately $\frac{1}{8}$ turn from the vertical 'Off' position) turns on ignition and gasoline gauge circuit but does not connect Startix. This switch position should be used in checking ignition to avoid automatic



WILLYS OVERLAND SIX

STREAM LINE MODEL 6-90A—AFTER JUNE, 1932

AUTO-LITE SYSTEM

cranking. The second 'On' position (approximately ¼ turn of switch key) is the normal operating position of the switch with Startix operative.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set spark plug gaps at .027".

VALVE TIMING:—**Camshaft Setting:**—Camshaft at right of engine is driven from crankshaft by two-sprocket non-adjustable chain drive. Sprockets are marked. Mesh chain with sprockets turned so that punch marks are adjacent and in line with straightedge across shaft centers. With correct setting, mark on rim of camshaft sprocket should be in line with mark on edge of front engine support with piston No. 1 on top dead center and flywheel mark 'IGN.TC./CYL.1-6' at indicator.

To Check Valve Timing:—Set tappet clearance No. 1 intake valve at .008", No. 1 exhaust valve at .009" (cold). With No. 6 piston on compression turn engine over until flywheel mark 'IO/' is opposite pointed screw on edge of inspection hole in left front face of flywheel housing. No. 1 intake valve should begin to open at this point. Turn engine over 5° to point where flywheel mark 'EC./' registers with pointer. No. 1 exhaust valve should close at this point. Reset tappet clearance at .004" (intake), .006" (exhaust) with engine hot.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 5/8"	.372"	45°	5/16"
Exhaust	1 15/32"	.371"	45°	5/16"

Tappet Clearance

Operating Timing

Intake	.004" (hot) .008" (cold)	Closed	.46 pounds—2 1/4"
Exhaust	.006" (hot) .009" (cold)	Open	.85 1/2 pounds—1 15/16"
Intake Valve		Timing	
Open—7° before top dead center.		Exhaust Valves	
Close—39° after lower dead center.		Open—49° before lower dead center.	
		Close—2° before top dead center.	

Valve Springs

CARBURETION:—Tillotson Updraft Carburetor, Model J1B. See Carburetor Section for complete data. Intake manifold heat control automatic.

Fuel Pump:—A.C. Mechanical Fuel Pump mounted on right side of crankcase (see Equipment Section for complete data). Remove glass sediment bowl when necessary, empty water and sediment, clean filter screen (located above bowl) before reassembling.

Gasoline Gauge:—K.S. Telegauge hydrostatic type gauge (see Equipment Section).

STARTER:—Model MZ-4030 (Custom and Sport Models), (MZ-4024 Standard Models). Starter drive—inboard Bendix with Startix automatic starting switch on Custom models and Pines 'Finger Tip Control' switch on Standard models. See Equipment Section for complete data on Startix and Pines switches. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4902	5.5	47 (with Bendix)
.65 "	2500	5.5	100
2.55 "	1325	5.0	200
4.95 "	750	4.5	300
7.65 "	220	4.0	400
10.1 "	Lock	3.5	470
12.25 "	Lock	4.0	545

Mounting:—Flange mounted on left hand front face of flywheel housing. To

remove, disconnect cable, take out 3 flange mounting screws, pull starter forward to clear Bendix, lift out.

Oiling:—500 Miles. Put 6 drops SAE. No. 20 engine oil in oiler at each end.

GENERATOR:—Model GAL-4331. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate (standard setting) is 17.2 amperes (cold) at 8.0 volts reached at 1900 R.P.M.

Charging Rate Adjustment:—Take off commutator cover band, shift third brush by prying on brush mounting stud counter-clockwise to increase, or clockwise to decrease charging rate. Brush held in position by friction.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.3	600	0	6.4	700
4	6.7	740	4	6.9	900
8	7.1	900	8	7.4	1150
12	7.4	1120	10	7.7	1340
17	8.0	1900	12.4	8.0	2150
12	7.4	3200	9.5	7.7	3200

Brush Spring Tension:—24-32 ounces (in service), 8-13 ounces (new brushes).

Field Current:—4.08-4.52 amperes at 6 volts across field terminals.

Motoring:—4.27-4.73 amperes at 6.0 volts.

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, loosen adjustment clamp bolt, swing generator toward engine and slip off drive belt, take out bolt forming bracket hinge, lift generator out.

Belt Adjustment:—Loosen adjustment clamp bolt and mounting bolt, pull generator away from engine until fan can just be turned with belt held stationary, tighten adjustment bolt and mounting bolt before slacking off on generator.

Oiling:—250 Miles. Put 6 drops SAE. No. 20 engine oil in oiler at each end. 1000 Miles. Remove grease cup under bearing retainer on commutator end, clean out old grease, fill cup with vaseline, dip wick in oil and replace.

RELAY:—Model CB-4021. With terminal for Startix. Relay mounted on generator field frame. Relay contacts close at 675 R.P.M. with generator voltage of 7-7.5 volts and charging current of approximately 2 amperes and open with discharge current of .5-2.5 amperes.

Contact Gap:—.025-.035 inch. **Air Gap:**—.010-.030 inch (contacts closed).

LIGHTING:—Pines Switch, Model A-805 (Standard Models), 6700 (Custom and Sport Models). Lighting switch 'Finger Tip Control' type mounted at lower end of steering column and controlled by knob on steering wheel. Type A-805 on Standard models includes starting switch. Type 6700 on Custom models is used with Startix and does not include starting switch. See Equipment Section for complete data. Lighting system 'depressed beam' dimming with standard double filament headlight bulbs.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158

Custom and Sport models have parking lights mounted on fenders. Standard models have parking bulbs in headlights. Stop and tail light has special double filament bulb and tail light lead must be connected to 2 cp. filament.

FUSES:—One 20-ampere capacity fuse mounted on left front of dash.

WILLYS OVERLAND EIGHT

STREAM LINE MODEL 8-88A—AFTER JUNE, 1932

AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—Stamped on plate on right hand frame side rail above right front spring rear shackle and also under driver's seat. First number this series—2401.

ENGINE NUMBER:—Stamped on left side cylinder block opposite No. 1 cylinder.

BATTERY:—U.S.L., Type 3-HVX-7X-6A, 6 volt, 15 plate, 142 ampere hour capacity (5 ampere rate). Starting capacity 148.5 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—Mounted on left hand frame side rail under front floor boards.

Dimensions:—Width, 7 7/16". Length, 11 3/4". Height, 9 3/4".

IGNITION:—Coil Model IG-4602. Coil mounted on dash. Coil is new type connected to ignition switch by armored cable.

Ignition Current:—1-3 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts with engine stopped.

Ignition Switch:—Type 16-S Electrolock integral with coil. Switch has two 'On' positions. First on position (1/8 turn from 'Off' or vertical) does not connect Startix and should be used for timing. Second 'On' position (approximately 1/4 turn to right) is regular running position with Startix operative.

Distributor Model IGH-4013. Two-breaker arm, 4-lobe cam, semi-automatic advance type. Distributor is retarded by pulling out spark control button for hand cranking and operation at low speeds or heavy pulling. Pushing in button advances distributor 20° (engine). Breaker contacts open alternately at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Ignition Timing).

Breaker Gap:—Set contact gap at .018". Hold within limits of .018-.020".

Breaker Arm Spring Tension:—16-22 ounces (measured at tip of breaker arm with spring scale centered and at right angles to arm).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
0.....	Start.....	Distributor	200.....	400
4.....	2.....	400.....	800.....	800
8.....	4.....	740.....	1480.....	1480
12.....	6.....	1000.....	2000.....	2000
16.....	8.....	1300.....	2600.....	2600
22.....	11.....	1700.....	3400.....	3400

Mounting:—Mounted at left center of crankcase and driven by inclined shaft from crankshaft. To remove, disconnect primary lead, disconnect manual spark control, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

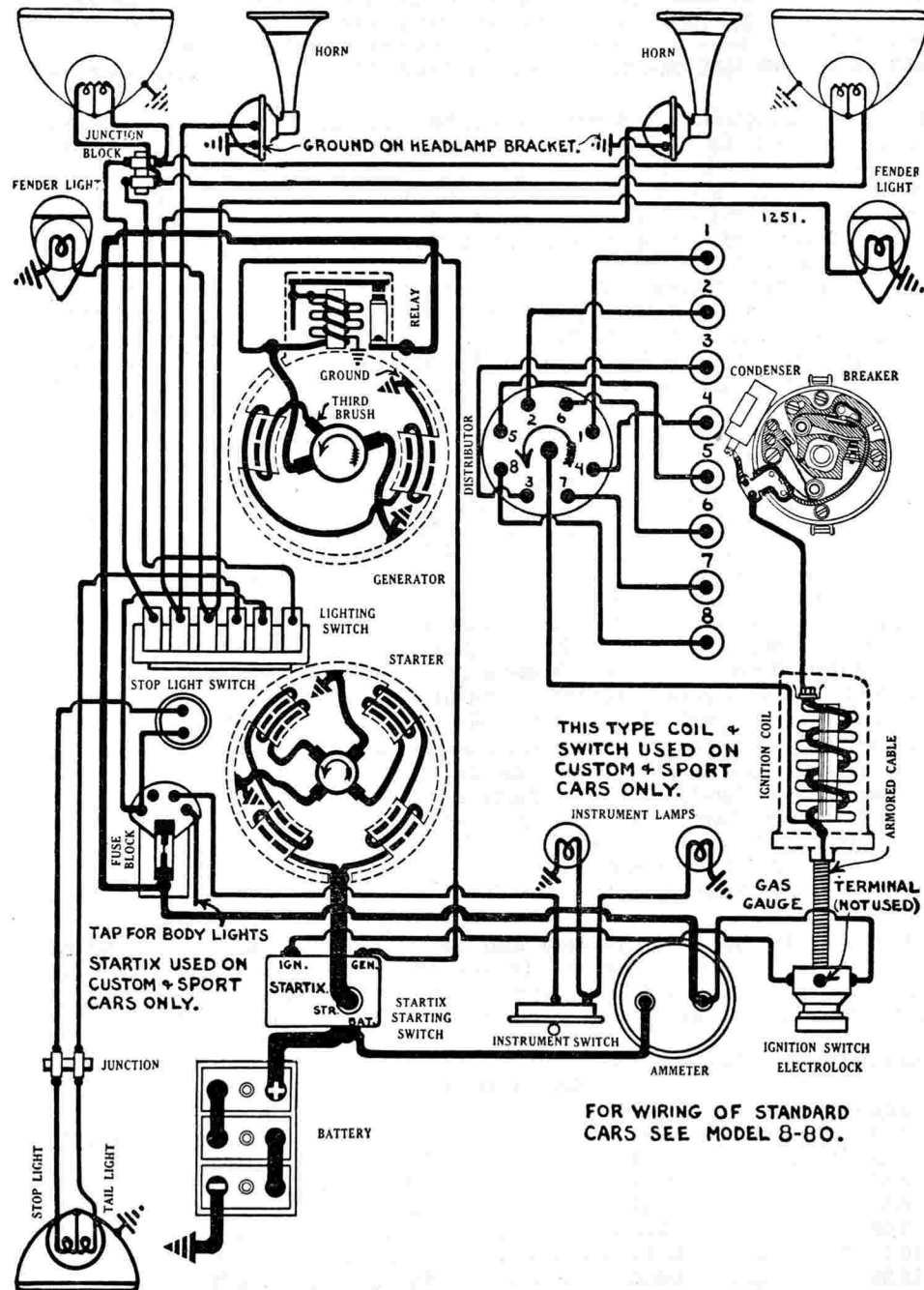
Oiling:—250 Miles. Put 6 drops SAE. No. 20 engine oil in oiler on side of shaft. Take off distributor cap and rotor, oil wick oiler in center of shaft. Put one drop oil on breaker arm pivot pins.

5000 Miles. Apply thin film vaseline to face of breaker cam.

IGNITION TIMING:—Standard Setting—6° (flywheel) or .0136" (piston travel) before top dead center with manual spark control advanced.

To Set Ignition Timing. Take off cover plate on inspection hole in right front face of flywheel housing, advance manual spark control (push button in toward dash) with No. 1 piston on compression, turn engine over by hand until flywheel mark 'IGN./' (which is 6° before top dead center mark '1&8.TC./I.O.') registers with pointed end of inspection cover plate screw. Loosen advance arm clamp bolt, rotate distributor until first set of breaker contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt. If ignition is turned on to check opening of contacts on Custom models equipped with Startix, use first 'On' position of switch (key turned approximately 1/8 turn to right) to avoid automatic cranking. See that rotor is directly opposite No. 1 terminal in distributor cap (see diagram) and connect spark plugs as indicated. Then synchronize contacts.

Synchronization of Contacts. No flywheel marks provided to synchronize



WILLYS OVERLAND EIGHT

STREAM LINE MODEL 8-88A—AFTER JUNE, 1932

AUTO-LITE SYSTEM

contacts on engine. It will be necessary to use a rotary spark gap or special Auto-Lite synchronizing tool. See Equipment Section for complete data on synchronization. If timing gauge is used, shift gauge to No. 6 cylinder and repeat timing. Do not loosen clamp bolt but loosen lock screws on movable sub-plate (carrying second set of contacts), shift plate until contacts begin to open, tighten lock screws.

Firing Order:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion Type #8. Set gaps at .027 inch.

VALVE TIMING:—Camshaft Setting. Camshaft at right of engine and driven from crankshaft by two-sprocket non-adjustable chain drive. Sprockets are marked. Mesh chain so that marks are adjacent and in line with straight-edge across shaft centers. With correct setting, mark on rim of camshaft sprocket should be in line with mark on edge of front engine support with piston No. 1 on top dead center and flywheel mark '1&8.T.C./I.O.' registering with pointer in inspection hole.

To Check Valve Timing. Set tappet clearance No. 1 intake and exhaust valves at .010" cold. With No. 8 piston on compression turn engine over until piston reaches top dead center with flywheel mark '1&8.T.C./I.O.' at indicator. No. 1 intake valve should open at this point. Turn engine over 4° until flywheel mark 'E.C.' registers with pointer. No. 1 exhaust valve should close. Reset tappet clearance at .006" (intake), .008" (exhaust) with engine warm.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 17/32"	.372"	45°	21/64"
Exhaust	1 15/32"	.371"	45°	21/64"

Tappet Clearance

Operating Timing

Intake	.006" (hot) .010" (cold)	92-100 pounds—1 15/16"
Exhaust	.008" (hot) .010" (cold)	

Intake Valves

Timing

Exhaust Valves

Open—At top dead center
Close—38° after lower dead center.

Open—34° before lower dead center.
Close—4° after top dead center.

CARBURETION:—Tillotson Updraft Carburetor, Model W5D. See Carburetor Section for complete data. Intake manifold heat control automatic.

Fuel Pump:—A.C. Mechanical Fuel Pump mounted on right side of crankcase (see Equipment Section). Remove glass sediment bowl when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—K.S. Telegauge hydrostatic gauge (see Equipment Section).

STARTER:—Model MAB-4035. Starter drive—Inboard Bendix with Startix automatic starting switch on Custom models and Pines 'Finger Tip Control' switch on Standard models. See Equipment Section for complete data on Startix and Pines 'Finger Tip Control' switches. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	46
0.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
17.0 "	Lock	3.0	525
24.0 "	Lock	4.0	720

Mounting:—Flange mounted on left hand front face of flywheel housing. To

remove, disconnect cable, take out 3 flange mounting bolts, pull starter forward to clear Bendix, lift out.

Oiling:—500 Miles. Put 6 drops SAE. No. 20 engine oil in oiler at each end.

GENERATOR:—Model GAL-4331. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate (standard setting) is 17.2 amperes (cold) at 8.0 volts reached at 1900 R.P.M.

Charging Rate Adjustment:—Take off commutator cover band, shift third brush by prying on brush mounting stud counter-clockwise to increase, or clockwise to decrease charging rate. Brush held in position by friction.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.3	600	0	6.4	700
4	6.7	740	4	6.9	900
8	7.1	900	8	7.4	1150
12	7.4	1120	10	7.7	1340
17	8.0	1900	12.4	8.0	2150
12	7.4	3200	9.5	7.7	3200

Brush Spring Tension:—24-32 ounces (in service), 8-13 ounces (new brushes).

Field Current:—4.08-4.52 amperes at 6 volts across field terminals.

Motoring:—4.27-4.73 amperes at 6.0 volts.

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, loosen adjustment clamp bolt, swing generator toward engine and slip off drive belt, take out bolt forming bracket hinge, lift generator out.

Belt Adjustment:—Loosen adjustment clamp bolt and mounting bolt, pull generator away from engine until fan can just be turned with belt held stationary, tighten adjustment bolt and mounting bolt before slacking off on generator.

Oiling:—250 Miles. Put 6 drops SAE. No. 20 engine oil in oiler at each end.

1000 Miles. Remove grease cup under bearing retainer on commutator end, clean out old grease, fill cup with vaseline, dip wick in oil and replace.

RELAY:—Model CB-4021. With terminal for Startix. Relay mounted on generator field frame. Relay contacts close at 675 R.P.M. with generator voltage of 7-7.5 volts and charging current of approximately 2 amperes and open with discharge current of .5-2.5 amperes.

Contact Gap:—.025-.035 inch. **Air Gap:**—.010-.030 inch (contacts closed).

LIGHTING:—Pines Switch, Model A-805 (Standard Models), 6700 (Custom and Sport Models). Lighting switch 'Finger Tip Control' type mounted at lower end of steering column and controlled by knob on steering wheel. Type A-805 on Standard models includes starting switch. Type 6700 on Custom models is used with Startix and does not include starting switch. See Equipment Section for complete data. Lighting system 'depressed beam' dimming with standard double filament headlight bulbs.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158

Custom and Sport models have parking lights mounted on fenders. Standard models have parking bulbs in headlights. Stop and tail light has special double filament bulb and tail light lead must be connected to 2 cp. filament.

FUSES:—One 20-ampere capacity fuse mounted on left front of dash.

AUTO-LITE GENERATING, STARTING SYSTEM NORTH EAST IGNITION

WILLYS KNIGHT

STREAM-LINE MODEL 66-E (AFTER JUNE, 1932), SERIAL NOS. 7601 UP
 AUTO-LITE GENERATING, STARTING SYSTEM
 NORTH EAST IGNITION

advance arm clamp screw and rotate distributor until contacts begin to open. Tighten the clamp screw and connect spark plugs as shown on the diagram.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Champion Type C-4. Gaps are .020 inch.

VALVE TIMING:—The Willys Knight engine is of the sleeve valve type. To time sleeve valves with eccentric shaft sprocket removed, remove pipe plug in exhaust manifold directly opposite No. 1 exhaust port and scrape carbon from edges of sleeve ports so that closing of ports can be checked. Remove inspection hole cover in flywheel housing and turn engine over until piston No. 1 reaches top dead center with the flywheel mark 'T.C.' directly opposite the indicator. Remove the spark plug in cylinder No. 1 and place a test lamp in the spark plug port so that the light can be seen through the exhaust port. Then turn eccentric shaft in direction of rotation until the upper edge of the port in the outer sleeve just passes the lower edge of the port in the cylinder block when the light will be cut off. Assemble eccentric shaft sprocket and timing chain, being careful not to disturb relative positions of eccentric shaft and crankshaft.

Valve Timing Specifications:—Intake ports open 10 degrees before top dead center and close 36 degrees after lower dead center. Exhaust ports open 45 degrees before lower dead center and close at top dead center. The exhaust closing point for cylinders No. 1 and 6 is marked on the flywheel by 'T.C./E.C.'

CARBURETION:—Tillotson Updraft Carburetor, Model V5B (see Carburetor Section for complete data). Manifold heat control is operated manually by button on instrument board.

Fuel System:—Stewart-Warner vacuum tank mounted on the dash.

Gasoline Gauge:—K-S Telegauge, hydrostatic type (see Equipment Section).

STARTER:—Model MAB-4018. Starter is connected to the engine through a Bendix drive. The direction of rotation is clockwise, viewed from the commutator end. Brush spring tension is 44-56 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
.6 lb. ft.	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
24 "	Lock	4.0	725

Starting Switch:—A Startix automatic starting switch is standard equipment. See Equipment Section for description and adjustment of this unit.

Mounting:—Starter is sleeve mounted at the right of the transmission on the rear face of the flywheel housing. To remove starter, disconnect cable and take out two dowel screws in flywheel housing directly above starter sleeve. Then pull starter to the rear to clear drive and lift from place.

Oiling:—Put 4 to 6 drops of light engine oil in the oiler at each end of the starter every two weeks or each 500 miles of operation.

GENERATOR:—Model GAG-4134. The direction of rotation is counter-clockwise at the commutator end. Third brush regulation. With standard car setting, maximum charging rate is 17 amperes at 8 volts (cold) reached at 1500 R.P.M.

Charging Rate Adjustment. Take off commutator cover band, shift third brush by prying on brush mounting stud, counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	550	0	6.4	640
4	6.7	660	4	6.9	800
8	7.0	760	8	7.3	980
12	7.4	900	10	7.6	1110
16	7.8	1120	12	7.8	1280
19	8.0	1500	14.2	8.0	1680
13	7.4	2400	11.5	7.7	2400

Brush Spring Tension:—22-27 ounces on each brush.

Field Current:—3.99-4.41 amperes at 6.0 volts across field terminals.

Field Fuse:—7½ ampere capacity fuse mounted on brush ring.

Motoring:—5.13-5.67 amperes at 6.0 volts.

Mounting:—Generator is cradle mounted at the right of the engine and is driven through a flexible coupling from the chain case. To remove generator, disconnect lead and drive coupling. Then loosen mounting strap and slide generator from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler at each end of the generator every two weeks or each 500 miles of operation.

RELAY:—Model CB-4021. Relay is mounted on the generator field frame. Relay contacts close at 575 R.P.M. when the voltage of the generator reaches 7-7.5 volts and open with a discharge current of 5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Pines Finger Tip Control Switch, Type 6700. Switch is mounted at lower end of steering column and is controlled by button on steering wheel. See Equipment Section for description of 'Finger Tip Control'. This switch is similar in design except that starting feature is not used and Startix starting switch is installed. Double filament headlight bulbs are used for 'depressed beam' dimming.

Lamp Sizes				
Position	Voltage	Candlepower	Base	Mazda Number
Headlights	6-8	21-21	DC	1110
Fender lights	6-8	3	SC	63
Dash lights	6-8	3	SC	63
Stop and tail light	6-8	21-2	DC	1158
Dome and corner lights	6-8	3	SC	63

Note:—Stop and tail light is fitted with a special double filament bulb. Tail light lead must be connected to the 2 cp. filament.

FUSES:—Generator field fuse is 7.5 ampere capacity. Lighting fuse mounted on fuse block on lower left front side of dash is 20 ampere capacity.

WILLYS

MODEL 77 (1933), SERIAL NUMBERS 1001 UP

AUTO-LITE SYSTEM

CAR SERIAL NUMBER:—Stamped on plate on left hand frame side rail near rear hanger of left front spring. First serial number 1001.

ENGINE NUMBER:—Stamped on upper right hand front corner of cylinder block. First serial number 1001.

ENGINE:—Four cylinder, 'L' head type, $3\frac{1}{8} \times 4\frac{3}{8}$ " bore and stroke, 134.2 cubic inch displacement, rated at 15.6 H.P., develops 48 H.P. at 3200 R.P.M. Standard compression ratio 5.13-1. Optional compression ratios are not offered.

BATTERY:—U.S.L., Type CW-11A, 6 volt, 11 plate, 84 ampere hour capacity (5 ampere rate). Starting capacity 96 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—In cradle between right hand frame side rail and 'X' member under right hand front seat.

Dimensions:—Width, $7\frac{1}{4}$ ". Length, 9". Height, $8\frac{5}{8}$ ".

IGNITION:—Coil Model IG-4406. Coil is mounted on right hand side of engine block above the starter.

Ignition Current:—3.1 amperes at 6 volts (engine running), 4.98 amperes at 6 volts (engine stopped).

Ignition Switch:—Electrolock, Type 17-A (no armored cable). See Equipment Section for complete data on this type ignition switch.

Distributor Model IGB-4078. Single breaker, four-lobe cam, full automatic advance type. Contact gap is adjusted by loosening lock nut on stationary contact mounting stud and turning up stud.

Breaker Gap:—Set contact gap at .018". Hold within limits of .018-.020".

Breaker Arm Spring Tension:—16-22 ounces measured at tip of breaker arm with spring scale at right angles to back of arm.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0.....		Start.....	300.....		600
4.....		2.....	510.....		1020
8.....		4.....	750.....		1500
12.....		6.....	970.....		1940
16.....		8.....	1190.....		2380
20.....		10.....	1415.....		2830
25.....		12½.....	1700.....		3400

Mounting:—Distributor mounted on right hand side of crankcase and is driven by an inclined shaft from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

Oiling:—250 Miles. Put 6 drops S.A.E. #20 engine oil in oiler.

500 Miles. Take off distributor cap and rotor. Put 4 drops S.A.E. #20 engine oil in wick oiler in center of shaft.

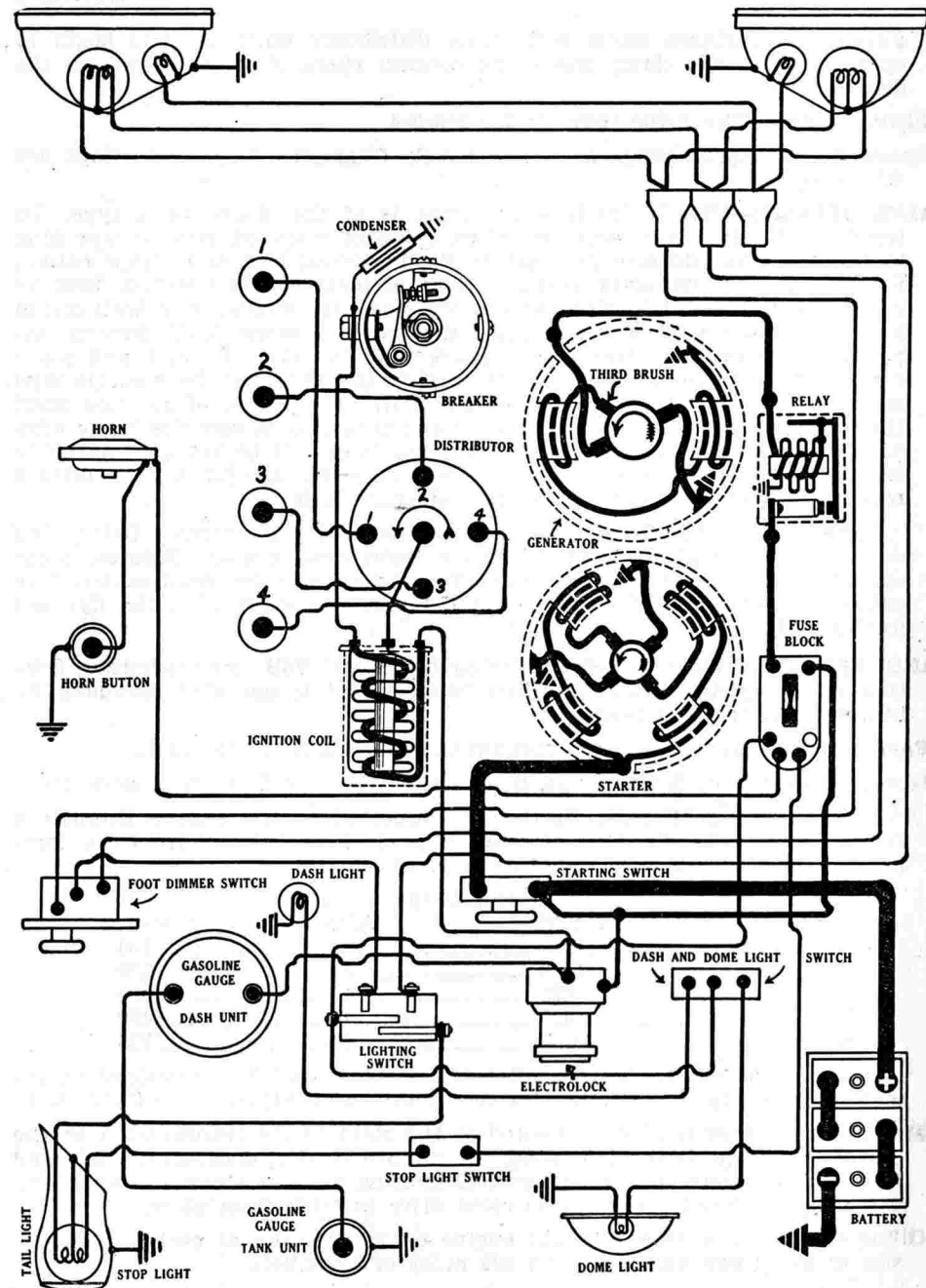
5000 Miles. Apply thin film of vaseline to face of breaker cam.

IGNITION TIMING:—Standard setting 4° (flywheel) or .0066" (piston travel) before top dead center.

To Set Ignition Timing:—Take off cover plate over inspection hole in top of flywheel housing at left of engine. With No. 1 piston on compression stroke, turn engine over by hand until ignition mark 'IGN' (which is 4° before top dead center mark 'I.O./T.C.1-4') is directly in line with pointed end of inspection plate screw, then loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated.

Firing Order:—1-3-4-2. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set gaps at .025".



WILLYS

MODEL 77 (1933), SERIAL NUMBERS 1001 UP AUTO-LITE SYSTEM

VALVE TIMING:—Camshaft Setting. Camshaft at left of engine is driven from crankshaft by two-sprocket non-adjustable chain drive. Sprockets are marked. To set timing, with crankshaft turned so that pistons Nos. 1 and 4 are on top dead center, mesh sprockets in chain so that marks on sprockets are adjacent and in line with a straightedge laid across the shaft centers.

To Check Valve Timing. With No. 1 piston on top dead center entering power stroke, set tappet clearance of No. 1 intake and exhaust valves at .010". Turn engine over one complete revolution and stop with piston on top dead center when flywheel mark 'T.C./I.O.1-4' is directly in line with pointed end of inspection plate screw in inspection hole in left hand top surface of flywheel housing. No. 1 intake valve should begin to open at this point. Turn crankshaft 5° and stop when flywheel mark 'E.C./' registers with the inspection plate screw. No. 1 exhaust valve should begin to close at this point. Reset tappet clearance at .004" (intake), .006" (exhaust) with engine warm.

Valve Specifications			
Head Diameter	Stem Diameter	Seat Angle	Lift
Intake .....1 17/32"	.372"	45°	21/64"
Exhaust .....1 15/32"	.371"	45°	21/64"

Tappet Clearance		Valve Springs
Operating	Timing	
Intake .....004" (hot) .010" (cold).		85 pounds—1 15/16 inches.
Exhaust .....006" (hot) .010" (cold).		

Intake Valves	Timing	Exhaust Valves
Open—At top dead center.		Open—40° before lower dead center.
Close—45° after lower dead center.		Close—5° after top dead center.

NOTE:—The exhaust closing point should be used in checking valve timing and is equivalent to a piston position of .0103" past top dead center.

CARBURETION:—Tillotson Downdraft Carburetor, Model D-1A (see Carburetor Section for complete data). Manifold heat control is adjusted manually at the manifold. Three settings are provided for by depressions in which the adjusting lever set screw is designed to seat. These positions are: Heat off (summer operation), Heat On (winter operation), and Midway.

Air Cleaner:—A.C. oil-wetted wire gauze type integral with silencer. Remove complete unit at 2500 mile intervals, clean by dipping wire gauze end of unit in pan of gasoline, dry thoroughly, re-oil by dipping in pan of engine oil, drain before reassembling.

Fuel Pump:—A.C. Mechanical type mounted on left hand side of crankcase and driven by eccentric on camshaft. Remove glass sediment bowl under pump, when necessary, empty water and sediment, clean filter screen (located directly above bowl) before reassembling.

Gasoline Gauge:—National electric type (see Equipment Section).

STARTER:—Model MZ-4033. Starter drive—Special Outboard Bendix. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces. Starter switch mounted on upper toeboard is Model SW-4191.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4900	5.5	47
.65 "	2500	5.5	100
2.55 "	1325	5.0	200
4.95 "	750	4.5	300
7.65 "	220	4.0	400
12.25 "	Lock	4.0	545

Mounting:—Flange mounted on right hand forward face of flywheel housing. To remove, disconnect cable, take out two flange mounting screws, pull starter forward to clear Bendix, lift out.

Oiling:—500 Miles. Put 6 drops S.A.E. #20 engine oil in commutator end oiler.

GENERATOR:—Model GAM-4504. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate is 17 amperes (cold) at 8 volts reached at 2400 R.P.M.

Charging Rate Adjustment:—Take off commutator cover band, shift third brush by prying on brush mounting stud, counter-clockwise to increase, or clockwise to decrease charging rate. Third brush mounting plate is held in position by friction. No ammeter is installed on the car and it will be necessary to connect a test ammeter in the generator charging circuit at the relay cut-out whenever the charging rate is being checked or adjusted.

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	700	0	6.4	760
4	6.9	880	4	6.9	1040
7	7.0	1000	8	7.3	1400
10	7.2	1180	10	7.5	1600
14	7.8	1520	12.8	7.9	2550
17	8.0	2400	12.2	7.8	3200
15.2	7.9	3200			

Brush Spring Tension:—18-22 ounces on each brush.

Field Current:—4.08-4.52 amperes at 6 volts across field terminals.

Motoring:—4.94-5.46 amperes at 6 volts.

Mounting:—Pivot mounted at right hand forward end of engine with fan belt drive. To remove, disconnect lead, take out adjustment clamp bolt, swing generator toward engine and slip off drive belt, take out two bolts forming bracket pivot under generator, lift generator out.

Belt Adjustment. Loosen two mounting bolts and adjustment clamp bolt, pull generator away from engine until fan can be turned with belt held stationary, tighten adjustment clamp bolt before slacking off on generator, tighten mounting bolts.

Oiling:—250 Miles. Put 6 drops S.A.E. #20 engine oil in oiler at each end.

RELAY:—Model CB-4008. Mounted on top of right hand frame side rail near generator. Contacts close at 700-800 R.P.M. of generator with generator voltage of 7.0-7.5 volts and open with discharge current of .5-2.5 amperes. **Contact Gap:—**.025-.035". **Air Gap:—**.010-.030" with contacts closed.

LIGHTING:—Lighting switch mounted at lower edge of instrument panel. Soreng-Manegold Dimmer Switch, Model D-2100-A mounted on toeboard. Double filament headlight bulbs used for 'depressed beam' dimming. A double filament bulb is used for the stop and tail light.

Lamp Sizes				
Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs	6-8	3	S.C.	63
Instrument Light	6-8	3	S.C.	63
Stop and Tail Light	6-8	21-2	D.C.	1158
Dome Light	6-8	3	S.C.	63

FUSES:—20 ampere capacity lighting fuse mounted on fuse block on right hand side of the lower cowl under the engine hood.

HORN:—Schwartz Vibrator disc type horn.